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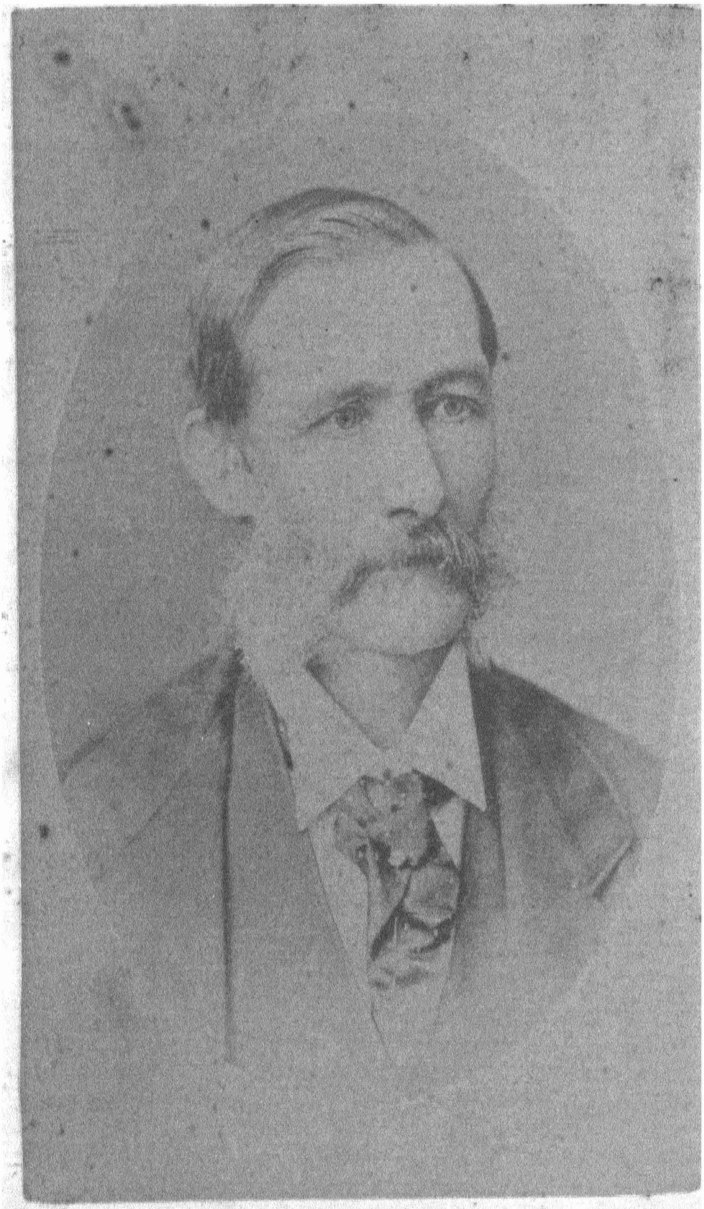

DIETRICH BRANDIS,

The Founder of Forestry in India.

THE

INDIAN FORESTER.

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DIETRICH BRANDIS,

THE FOUNDER OF FORESTRY IN INDIA.

WE have ever since Mr. Brandis said his last farewell to India, considered it our duty to place before our readers a short history of the introduction of scientific forestry into the Eastern Empire, which would mainly be an abstract of the work done by the eminent founder of our department. The only excuse for delaying this till now we are able to offer to the public and our retired chief is that, in his organization of the department he has provided us with work and public duties sufficient to leave but little spare time for a labor of love.

Even now the record we are able to compile can profess to be but a scanty representation of 27 years of untiring and arduous work. The results of this life of labor have no doubt been brilliant, and may be gauged by the public at large, but its utter unselfishness and devotion can only be understood by a few initiated, who have themselves lived through the early struggles of forestry in India, or who have made the growth of our beloved science in this empire a special study.

Sporadic attempts at forest conservancy had been made, especially in Burma, where the value of forest produce at once attracted public attention, previous to Mr. Brandis' era, but of whatever value such attempts may have been at that time, they were founded on no sound basis, and have long since disappeared, leaving as sole traces of their existence a few impracticable leases as usual entirely in favor of mercantile pioneers, as people who cut down a virgin forest for their own profit are pleased to call themselves. In spite, however, of the but temporary success consequent to opinions and events over which the originators had no control, we must note the sound proposals made, and the important measures introduced, by Dr. Wallich and Captain Gathin as early as 1827 and 1845, which are duly recognised in Mr. Brandis' report on the Attaran forests of 1860.

In January 1856 Mr. Brandis was appointed Superintendent of Forests in Pegu, in British Burma, and in 1857 the forests of Tenasserim and Martaban were added to his charge. In this

position he remained till December 1862, when he was translated to wider duties under the Government of India.

Mr. Brandis' work in Burma forms, therefore, the first period of his Indian career, and not the least brilliant one.

Immediately after his arrival Mr. Brandis proposed to himself three questions as the first ground work to the introduction of a sound administration of the Pegu forests. These questions, simple in themselves, proved at once that the Government had secured the services of an officer of a very superior common sense and judgment ; and the way in which the answers to them were worked out, in spite of all difficulties at the cost of untiring labor and severe hardship with utter disregard to personal comfort and convenience, and even at the sacrifice of health, must ellicit our highest admiration.

The questions were :—

1. How can the produce of the forests be turned to account in the most advantageous manner?
2. What measures must be taken for the preservation of the forests? and
3. What can be done for the extension and consolidation of the forests?

To answer the first question it was of course necessary to form some estimate of the amount of timber the forests would be able to yield without deterioration, and the first step was naturally to make a valuation of the growing stock.

Here again Mr. Brandis hit the nail on the head, and introduced a system of valuation surveys, so eminently adapted to the circumstances, that with but slight modifications it is still in force up to the present day.

"Linear Valuation Surveys," it is thus Mr. Brandis has named his method, excels by its simplicity. The trees along certain lines, roads, ridges, streams or lines chosen cross country are counted, classified according to their girth, and ticked off on small pieces of bamboo, split into thin strips, each of which is again notched into ten pieces, which can be turned down one by one. Different pieces are carried for the different classes of trees. This shift is extremely useful in a country like Burma, where on account of rain or dew it is often difficult to use a pocket book.

At the beginning all trees that could be seen from the line traversed were counted, but though this method gave a fair idea of the character of the forest, it was soon found that it was preferable to substitute a fixed distance, in order to obtain a fixed factor on which a somewhat more accurate estimate for the rest of the forest areas under observation could be formed. The distance on which the trees were thus counted was at first fixed at 100 feet, but subsequently, on account of the frequently extremely dense growth of the Burma forests, at 50 feet on each side of the line traversed.

Mr. Brandis made of course the teak, which at that time was the only tree the extraction of which was at all remunerative, the main object of his observations, and divided them at first into four classes—

I. Trees of 6 feet (4 cubits) and above in girth.
II. Trees of 4 feet 6 inches to 6 feet (3–4 cubits).
III. Trees of 3 feet to 4 feet 6 inches (2–3 cubits).
IV. Trees under 3 feet (2 cubits) girth and seedlings.

Subsequently these classes were re-arranged, and all trees down to 1 foot 6 inches were included in the 3rd class, leaving only those below 18 inches in the 4th class.

During the first year's observations Mr. Brandis found that the numbers of trees in the first three classes were very nearly equal in all but recently worked forests, and having thus obtained some idea of the proportion of the different classes, he proposed to himself the principle that, in any forests to be worked out, as many 1st class trees as would be replaced during the year by the growing stock of 2nd class trees, could and should be felled in that period.

Here we have the fundamental principle on which all working plans must *primâ facie* be based.

To estimate the number of 2nd class trees that would each year attain 1st class dimension, it was of course necessary to ascertain the rate of growth of teak, and Mr. Brandis was too cautious to accept without further proof the theory of annual rings representing one year's growth, and augmented his data by the measurement of a few trees, the age of which was known.

From the data at his disposal he constituted the following table :—

Girth in feet.	Age in years
3 feet, ...	18
4 feet 6 inches, ...	39
6 feet, ...	62

On this table holding about the middle between data regarding the growth of teak obtained from Bombay and Jává, he decided to base his working plan until better data became available.

Mr. Brandis accordingly laid down that $\frac{1}{24}$th of the 1st class trees in each forest might annually be cut, and assumed that as the number of 4th class trees had been found largely to exceed those in the other classes, the forests would gradually improve under the proposed system of working, and become richer in teak than they were in 1856. This prognostic has so far proved true at least whenever the forests have been worked by direct Government Agency.

The plan of thus felling and extracting $\frac{1}{24}$th of all 1st class trees annually in each forest was open to practical objections, both with regard to labor and supervision. On account of this Mr. Brandis arranged the Pegu teak forests in six divisions,

each of which he worked in turn, girdling every 6th year ¼th of the 1st class trees in one division.

Mr. Brandis prepared next an estimate of the probable outturn of the Pegu forests. The linear surveys, it was calculated, covered an area of 30 square miles, and on these 2,423 1st class trees had been counted, or an average of about 80 trees per square mile. It was roughly estimated that the total area on which teak was scattered in Pegu amounted to 7,000 square miles, and a grand total of 5,85,000 first class trees was accepted. Thus in theory the outturn could have been fixed at 24,000 trees per annum; but Mr. Brandis clearly understood that many of the trees were growing in inaccessible localities, or for other reasons were of insufficient value to draw a purchaser, or to pay for their removal, and he consequently reduced the estimate to an average outturn of about 24,000 logs per annum.

Many alterations have since been made in the estimate, most of them by Mr. Brandis himself, or under his immediate supervision, as the whole of the forest area became better known and data on which to base calculations more plentiful, but on the whole it is wonderful what a good estimate Mr. Brandis managed to make of the resources of the Pegu forests within a year of his arrival in the country.

As regards the method of working the forests, Mr. Brandis had the following three systems to choose from :—

(1). The levying of a duty on every log brought from the forests, the felling of the trees being either free or restricted to the holders of a permit or grant.

(2). Selling the whole of the seasoned timber in a certain forest to the highest bidder.

(3). Bringing down the timber from the forests on account of Government, and disposing of it by periodical sales to the highest bidder.

Mr. Brandis recognized that the first system then actually in force in Burma, must cease, as it would inevitably result in the ruin and destruction of the forest. The choice was thus reduced, and either the second or third system had to be adopted. Mr. Brandis recognized that, provided the marking and girdling of the trees to be felled remained in the hands of the Forest Department, the second system was theoretically more correct than the third, as it encouraged private enterprise, and left the Forest Staff free to devote their time to general forest administration, and to the preservation, extension, and consolidation of the forests.

The prices, however, which were offered for the timber in the forests were so low, that it would not have been remunerative to sell. Moreover, whenever this mode of working had been introduced it had proved to be wasteful and unreliable. It was like skimming the cream of the milk, and private parties who had only a temporary interest in the forests were not likely to under-

take on an extensive scale works which had of necessity to be undertaken to thoroughly open out the forests, such as clearing of obstructions, blasting and road making, nor were they likely to pay the slightest attention to reproductive measures.

Considering all these points, Mr. Brandis arrived at the conclusion, that Government must show the way of working the forests on an improved and less wasteful system. He put, however, at the time, on record that once a permanent improvement in the working had been effected, the system of departmental working might safely be changed for one of selling the timber in the forests, provided reasonable prices were offered for the seasoned timber.

Mr. Brandis tried accordingly to work the forests on Government account by means of contractors, who were to fell the timber, drag it to the floating streams, and raft it to the sale depôts, but was at the outset met by new difficulties, for no local contractors were forthcoming. But again, thanks to his unflagging energy, he gained a victory, he imported contractors from Moulmein, selected energetic men in Pegu, or wherever he could find them, and succeeded in bringing some 13,000 logs to depôt during the very first season, though he was beset by all sorts of difficulties, as both his subordinates and his contractor were constantly trying to over-reach him. Government marks were erased, and some of the timber was sold, instead of being delivered at Rangoon, some first class Government logs were exchanged against an equal number of inferior logs belonging to private parties, and even near the Rangoon depôt the timber was not safe, whole rafts were detached during dark nights and borne away on the strong tides, were taken to hiding places amongst the numerous creeks and backwaters. In one of the Sittang forests, the contractors dragged a portion of the Government timber across the frontier, and afterwards imported it as foreign timber.

The forest subordinates and contractors and the population living on the banks of the floating streams had all combined, but their tricks were found out one by one, and their robberies were discovered and punished, and measures were invented and adopted to check and prevent the systematic cheating and theft. It took years to break up the combinations that were formed to rob Government, but the system introduced by Mr. Brandis in 1856 has since been elaborated, and the Pegu forests are now worked by contractors on Government account with the most satisfactory results.

For some years the second of the above-mentioned systems, the exploitation by private enterprise, was introduced in consequence of a strong agitation on the part of the leading merchants and under pressure from the Local Government, but the trial resulted in a failure with regard to finance as well as forest conservancy.

Mr. Brandis having thus created a system for the working of the Pegu forests, and proved, as far as proof was at that time possible, that its operation if faithfully carried out would not endanger their preservation, next proceeded to take steps for the preservation of the forests against other causes.

These measures he classified under the following heads :—

1. Protection against injurious and irregular felling.
2. Protection against jungle fires.
3. Protection against toungya or hill cultivation.
4. Protection against natural causes, such as creepers, parasites, shade of the trees, &c.

With the view of enforcing a proper protection of the forests, a set of 22 rules were published in October 1856. These rules provided for the appointment of a Superintendent of Forests, his Assistants, Gaungs, and Gaungways (watchers); they next prohibited or regulated cutting of teak, prohibited teak being injured, the setting of fire to teak timber standing or felled, prohibited the burning of toungyas on a spot on which more than 50 teak trees stand. They further provided for the reservation of certain tracts, protection of boundary marks, and the disposal of teak timber locally. Finally, it was ruled that all cases of infringing these rules should be tried by the Superintendent of Forests, either by personal enquiry, or on the record of enquiry made by a Forest Assistant. The only appeal lay to the Commissioner of Pegu.

With regard to jungle fires Mr. Brandis drew special attention to their injurious effects by—

(*a*), destroying or damaging timber seasoning in the forests;
(*b*), destroying or, at any rate, cutting back of seedlings and young trees;
(*c*), destroying large quantities of teak seed, and thereby retarding reproduction.

Mr. Brandis did, however, at that time (1856) not see his way towards preventing these jungle fires.

As formidable an enemy as the fire was found in the system of temporary cultivation universally practised by the hill tribes in Burma, as well as by the inhabitants of the plains when living near large forest areas.

This system, called "toungya" in Burma, consists in the clearing of the forest ground by axe and fire. The young trees, bamboos and other undergrowth are felled, and the larger trees are lopped and frequently killed by girdling. The vast quantity of timber and brushwood on the ground is then allowed to dry, and is ultimately fired. The few trees that may have escaped the axe are either killed, or at least permanently injured, during the fierce conflagration, in witness whereof hundreds of thousands of dead trees charred and with bare blackened branches may be found all over Burma. The area thus barbarously cleared is

sown and abandoned frequently after one, certainly after a few, year's crops have been obtained. As soon as left to nature, the land clothes itself with a dense growth of herbs and grasses, and for years till this growth gets less dense, and again makes place to arborivegetation, no teak seedlings can, unaided, spring up in and penetrate the dense jungle growth.

To prevent as far as possible the evil effects of toungya cultivation, it was ruled that no toungya should be cut on any spot which contained more than 50 teak trees large and small, and that dry standing trees and felled teak timber should be removed beyond the effects of toungya fires.

Mr. Brandis, moreover, recognized that the very system which till then destroyed teak forests might be utilized to produce them, or at least to ameliorate their character, and as early as 1856 an attempt was made in the Prome district to sow teak in regular rows, together with the rice scattered by the toungya cutters.

Twenty years afterwards this attempt had grown into a regular system, by which at present large areas are annually stocked with teak at a cost far below that of regular plantations.

Mr. Brandis also commenced at the very outset to wage war against the evil effects upon reproduction and growing stock caused by creepers, parasites and the shade of inferior trees, the timber of which he contemplated of introducing in the market so as to pay for the expense of removing them. He worked steadily in this direction, making experiments regarding the qualities of other wood, and publishing accounts thereof, and, though he himself did not succeed in his aim, he prepared the way for his successors, and at present considerable revenue is made from trees other than teak.

The last question before Mr. Brandis was—"What can be done for the improvement, extension, and consolidation of the forests?"

This he dealt with under the following heads :—

1. Pruning.
2. Plantations.
3. Nurseries in toungyas.
4. Thrown out seed in cleared portions of the forests.
5. Consolidation of the teak forests.

Pruning he considered at that period still impracticable, but experimental plantations were made in localities specially selected, forming the nucleus of extensive plantations in future years.

Mr. Brandis from the very beginning was an advocate of the system of planting in lines in preference to any other method, and of raising a mixed forest and not one of pure teak. The advantages of line planting are great, but future experience has shown that a distance of 6 by 6 feet more effectually checks the growth of young bamboos. The system of planting teak in toungyas has already been noted, as well as its further development.

The third method recommended by Mr. Brandis, that of throwing seed in the forest, has of late years been developed in-

to a markedly successful system. At present large areas over which the bamboo has flowered are cleared by fire, and cultivated before a jungle growth springs up, and this is the cheapest of all modes of cultivation. Mr. Brandis' successors have, especially as regards reproduction, faithfully proceeded on the lines sketched out by him as early as 1856, and the reproduction and welfare of the Pegu forests have been doubtlessly insured thereby.

Mr. Brandis found very soon that one of the chief obstacles of successful forest management was the scattered distribution of the teak trees, some 5,00,000 marketable trees being scattered over 7,000 square miles, and he very rightly at once urged the consolidation of the teak localities. His idea was to select the better tracts, and to convert them by protection, sowing and planting into localities containing mainly teak forests, so as to concentrate operations upon a smaller area, and thus to make the constructions of roads and other works financially remunerative.

This idea laid the basis to our present system of reserved forests, which would have made a still greater progress but for the unfortunate choice of the name "reserved forests." The constitution of State forests has been frequently proposed for the very well being of the surrounding population, but without result, as the authorities regarded them however unjustly as reserved, *withdrawn* from general usefulness.

Whilst thus reviewing Mr. Brandis' first year's work, the remarkable accuracy with which he at once hit on the leading principles of forest management in India must necessarily strike any reader. Changes have of course been made during the future development of forest administration, but the smallness of such changes, both in number and importance, that have taken place during the last 29 years is astonishing, and nothing shows more the wonderful care and the sound judgment with which Mr. Brandis worked from the very beginning.

During 1857 and up to July 1858 Mr. Brandis devoted his attention mainly to the administration of the Pegu forests situated between the Sittang and Irrawaddy on the principles already noted. He enforced the forest rules, checked wanton destruction of teak, and regulated or prohibited the formation of toungyas in teak localities, without causing dissatisfaction amongst the Karens and other forest tribes: he carried out considerable forest improvements, and started numerous small plantations. He found it at that time still impossible to induce villagers to sow teak in their toungyas, but he clearly foresaw the future importance of that method of restoring the forest, and states—"this, if the people can ever be brought to do it, is likely to become the most efficient mode of planting teak in this country."

Great improvements were also made during the time in the dragging, rafting and floating of the timber, and in July 1858 Mr. Brandis was able to leave the executive work of the Pegu

forests in the charge of the Assistant officers he had appointed, for a sufficient time to permit him to examine the Attaran forests.

The first result of this examination was a most interesting report, which we recommend to the study of every forest officer as one of the most instructive forest reports that has ever been written.

"The teak forests of this Province," as Mr. Brandis points out, "are not extensive well defined tracts covered with one or a few species of trees, all useful and valuable or nearly so. Teak trees are found scattered in a forest, mainly consisting of trees of other kinds, all at present valueless, or nearly so, if compared with teak. Teak trees are either found *singly* scattered over a wide extent of ground, or they form isolated groups *of a few trees only;* or, lastly, teak is one of the *regular constituents* of the forest bearing a variable, but mostly small, proportion to the trees of other kinds.

"Localities where teak occurs are designated as *teak-producing* tracts. Between them there are others without any teak in them, and frequently bearing a forest consisting of a class of trees altogether different."

The teak-producing areas had, therefore, first to be found in the enormous forests which cover British Burma, and the two questions—

"(1), What is the area of teak-producing tracts in Tenasserim?" and (2), "What is the amount of teak on teak localities within a given area?" simple as they read, could only be solved at the cost of the most untiring labor.

Mr. Brandis had again recourse to linear surveys.

At the time Mr. Brandis' Attaran report was written, the valuation surveys actually covered an area of 42½ square miles, which necessitated linear surveys of over 800 miles in length.

Mr. Brandis found that in the teak-producing forests in Attaran the teak tree formed about $\frac{1}{10}$th of the whole peuplement, and that the different age classes of teak bore the following average proportion per mille :—

1st class,	...	...	...	147
2nd „	...	...	...	100
3rd „	...	...	...	205
4th „	...	...	...	548
			Total, ...	1000

These observations confirmed those made in the Pegu forests in 1856-57 as regards the general character of Burma teak forests. The Attaran report contains an extremely clear and useful description of the different varieties of teak-producing forests, and their classification noted down by Mr. Brandis in 1858 is still our standard, which may be accepted as another proof of the wonderful power of accurate observation which Mr. Brandis brought to bear on every detail of his work.

Neither time nor space permit us to follow the author of the

Attaran report further through his interesting description of the Attaran forests, nor can we at length trace the history of their administration under British rule which Mr. Brandis follows step by step.

The history exhibits a chain of vain attemps of a vacillating Government to protect forests against private exploitation, or to stand between the British speculator and his prey.

Mr. Brandis showed how all the many well intended conditions regarding manner of felling and measures to be adopted to ensure reproduction, and the future well being of the forests, with which the leases were plentifully seasoned, had in practice proved Utopian and meaningless.

He dispelled next the hope which had been entertained that all former wastefulness could be easily repaired by artificial cultivation, showing the enormous cost of extensive plantations in unhealthy localities rendered infinitely more difficult by the almost total absence of local labor.

Of the future of the Attaran forests Mr. Brandis took a somewhat gloomy view, in fact he thought that the best use that could be made of them would be to serve as a warning example to the rest of all India of the deplorable results of private management, and all he proposed was that the boundaries of leased forests should at once be clearly defined, that forests under leases and those still at the disposal of Government, should be separated, and in fact he initiated those stages by which all that could be saved of these once most valuable forests was saved, and prepared the way for the gradual resumption of the leased areas.

During the following years Mr. Brandis promulgated a revised and more comprehensive set of forest rules, which were sanctioned in December 1858. The control of the drift timber was placed in the hands of the department, a step which hereafter yielded not only handsome profits to Government, but secured honest traders from timber piracy and heavy losses of timber in transit; though at the time this step found strong opposition, for like most generally useful measures, this also affected the interests of a few.

Near the end of 1859-60 the clamour to permit private enterprise to exploit the teak forests became more pressing, and Mr. Brandis was somewhat disheartened with the general financial results of the first four years' working, which he considered at the time in no way adequate to the toil and anxiety the work had entailed. He expected more rapid returns from his arrangements, and took a much more gloomy view of the financial state of his operations than were justified by subsequent events.

This combination of circumstances led to the introduction of the permit system. Mr. Brandis introduced the system as cautiously as possible, and bound the permit holders by extremely rigid provisions; but in spite of all precautions it turned out to be another proof against the advisability of leav-

ing the exploitation of forests in the hands of speculators. An excellent set of rules were made to regulate the girdling of teak trees, and as only timber seasoned by the Forest Department was sold to the permit holders in the Pegu forests, this precaution was thought to dispose of any apprehension in that direction, but it was hereafter found that the very girdling operations were influenced by the agents of a large Rangoon firm. At the same time, however, when Mr. Brandis was pressed to yield with regard to the permit system he retained the most valuable of the Tharrawaddy forests, and introduced the system of loaning Government elephants to deserving contractors instead of making money advances, and this method forms now the ground work of all exploitation by direct Government agency, except in a few rare cases where large capital, content with reasonable profits, has stepped in, which not in need of advances of any kind rules the labour market.

Under the system of loaning elephants we have gradually created a class of men who have no choice, but must work for the Forest Department, which therefore entirely rules the market as regards conditions and rates. Both, however, are kept sufficiently liberal to make forest exploitation a very good livelihood, which sometimes may even lead to the accumulation of a small fortune. It may happen of course that elephants die and a man may lose the accumulation of years of labour, but in such cases the Forest Department is extremely liberal in its own and the contractor's interest, and a hard working and deserving man is never allowed to sink. The introduction of this method has given to the Forest Department both greater profits and more power than any other measure ever invented.

Mr. Brandis paid throughout these years the greatest attention to the improvement of the export lines from the forests, by clearing away obstructions and digging canals, amongst which the Schwaylay canal is the most important. This canal opened out a considerable forest district, and is still in use. All these improvements of course shortened the time it took for timber to reach the market from the forests, and lessened the chances of its being lost on the way.

The Rangoon depôt was formed into a central market place, at which periodical sales were held, and the disposal of timber under free grants for churches, chapels, kyoungs and schools was regulated.

The actual forest work of the whole of Pegu was thus concentrated in the Tharrawaddy Division, and it was therefore considered necessary by Mr. Brandis to remove the head quarters of the Forest Department from Rangoon into the vicinity of the forests. The old royal town of Myodwin was selected, and a large forest settlement was established. Mr. Brandis hoped that the Myodwin settlement would be the foundation of a permanent and growing location. In this he was disappointed, and hardly

any traces of it are left, thanks to the rapid expansion of forest work in Burma, which demanded the re-transfer of the head quarters to the centre of Government. Still the choice of head quarters for the work then in hand could not have fallen on a better place, and nothing helped more to get the work of the Tharrawaddy Division well in hand.

All this time the search for teak-producing areas and their examination was carried on with unflagging energy. In Pegu the forests west of the Irrawaddy were examined, and nearly 12 square miles of valuation surveys were made. The southern forest, including the valleys of the Pegu river, the Pounglin and the Hline, were searched through and through, and almost every teak locality was found and carefully examined and described. These forests are some of the most impenetrable and deadly in Burma, and must be known to appreciate the energy and application necessary for their thorough exploration to that extent as they ought to be appreciated.

The large teak areas on the Khaboung and the belts of teak forests on the eastern tributaries of the Sittang above the Thonkyeghat were most carefully explored, valued and described, as well as evergreen forests in the basins of Hpyoo, Koon and Bonee streams, in which teak-producing localities are scattered here and there. These forests were only visited by Karens and a few intrepid elephant hunters and dacoits. Their unhealthiness is so notorious, that the natives in the Shoay-gyeen district have a proverb—"He that awakens a sleeping tiger, the girl that loves a white man, and he that sleeps in Bonee forest, will come to grief and be ruined for life."

Still, Mr. Brandis' strong sense of duty made him live for weeks at a time in these forests, and by making friends of the original inhabitants, who throughout Burma still remember and love "Byandi thikin," he was able to explore these unknown forest areas with a degree of thoroughness which is perfectly astonishing.

In Tenasserim, the forests on the Beeling, Yoonzaleen and Upper Salween, the Lower Salween and Doomdamee, and the Thoongeen were explored during the same years, and a preliminary working plan was framed for them on very much the same principles as those originally adopted for the Pegu forest.

The forest area was also divided into six divisions, work to be carried on in one division at a time.

The annual outturn was estimated at 8,096 trees, divided amongst the divisions as follows :—

		Trees.
1st Division—	Beeling forests; probable annual outturn, ...	1,360
2nd ,,	Yoonzaleen and Upper Salween forests, do. do,	1,463
	Carried over, ...	2,823

					Trees.
		Brought forward, ...			2,823
3rd Division—	Lower	Salween	and	Doomdamee,	1,426
4th, 5th & 6th	"	Thoongeen,	do.	do.,	3,847
				Total, ...	8,096

The working plan was based on actual surveys of $20\frac{6}{10}$ square miles of valuation surveys, on which 83,499 teak trees were counted, including 21,532 of the 1st class; the entire teak-producing area, excluding the upper portion of the Thoongeen above the Melgat being estimated at 552 square miles, and the rotation being fixed at 122 years.

The year 1861 was still a period of great anxiety to Mr. Brandis.

The expenditure, especially on the Pegu side, was very large, and the revenue still failed to be realized to the amount expected; however, at the end of the year the prospects brightened, and Mr. Brandis was able to close his annual report with the words—"This is the first Annual Progress Report on the Pegu forests which I can close with a defined hope of good success at a period not far distant."

The results of the improved management of the Tenasserim forests became also apparent, the net revenue having risen in the last 3 years from Rs. 9,734 to Rs. 73,335.

The system of loaning elephants introduced in the previous year had been rapidly developed, and 73 animals had been made over to contractors, the waterways were uninterruptedly cleared of obstructions, the protection of timber in transit improved, and altogether the wheels of the department began to work more smoothly, so that Mr. Brandis expressed a hope to be able gradually to withdraw from executive work, a large share of which had till now rested on his shoulders. He personally conducted the extensive girdling operations during 1857 and 1858, and supervised in detail the introduction of working the Tharrawaddy forests by direct Government agency.

In 1860-61 Mr. Brandis introduced the sale of permits in Tenasserim by public auction, by which the rates realized per log were raised by Rs. 2 all round. Numerous forests were again explored and examined: in Pegu the forests on the Paddey and Choungoungyee, as well as the Swa, Myolah and other frontier forests and the whole of the Shoay-gyeen district; and in Tenasserim all forests on the Beeling stream. Girdling operations were carried on under competent supervision.

During this and the following year an influential combination of merchants pressed again for the introduction of exploitation by private enterprise, and Mr. Brandis had a bad time of it. He saw clearly enough that the promises of the mercantile

firms in Rangoon to bring European energy and skill to bear upon the working of the forests were empty words, and that natives would be employed by the firms, where natives were employed by him, and he naturally preferred those he had selected and trained, and he had to defend his principles. During that time he was attacked from all sides.

The timber brought down by the Forest Department, of which as yet only a small proportion was the result of their own girdling, was criticised as wretched and worthless, and it was said that greater vigour would be displayed in the working of the forests by private agency.

All this must have been extremely galling to an officer who had sacrificed all his labour, all his energy, and who had toiled for 5 years to work the timber resources of the country on a system of strict conservancy ; but still worse he was left to fight the battle alone, till in September 1861 the Governor General in Council recognized the position of the case and Mr. Brandis' special services. The outcome of a long correspondence, and several meetings, was that the Forest Department retained unconditionally the management of the exploitation of the Tharrawaddy forests, and that the rest of the Pegu forests were disposed of on 12 years' leases, specially prepared under the advice of the Advocate General. That Government, anxious for an immediate return from their forests, were heavy losers by these transactions financially, as well as from a forester's point of view, was proved by subsequent events.

The leases were no doubt entered into under Mr. Brandis' *régime*, but it is our pleasing duty to note here the following paragraph taken from a Government letter :—" I am to add that the Governor General in Council observes that great credit is due to that gentleman (Mr. Brandis) for the frank and hearty way in which the present papers show him to have acted in promoting the views of Government (opening the forests to private enterprise), though evidently opposed to his own ideas and disappointing to his hopes."

The rest of Mr. Brandis' direct administration of Burma flowed in quieter channels ; means of exploitation were constantly improved, and export lines and waterways received the necessary attention. Girdling operations were combined with more and more detailed examinations of the forests, topographical surveys of the more important forest areas were begun, and improvements were introduced in every branch of the Department, which it would be impossible for us to follow up in detail.

Before leaving the Province Mr. Brandis framed a working plan for the second rotation from 1862-67. The total number of trees to be girdled in British Burma during that period amounted to 1,71,842.

Mr. Brandis left Burma on special duty on the 29th of November, 1862, and the permit holders no sooner felt the withdrawal of a strong hand than they began to agitate for new

concessions, which were clamoured for in an (for the time when the science of forest conservancy was not so generally understood) extremely smart letter, in which it was pointed out that forestry carried on under Mr. Brandis' rules, and on the principles laid down by him, would in practice be destructive of all hope of making the forests of the province a source of revenue to Government, or a source of supply for timber, and an element of wealth and prosperity to the country.

The fallacy of this statement has long been proved by events, but at the time it was the basis of a demand which amounted to nothing less than that the permit holders should be permitted to girdle themselves all marketable timber within the limits of the forest leased by them.

This demand, which of course would have insured rapid profits to the permit holders at the cost of the State, was supported by the officiating Conservator of Forests, and was submitted by the Local Government, who even moved thereto by the statement that the permit holders lost heavily by the exploitation of Government forests under the form of leases in force, which provided that all girdling was to be done by the Forest Department under strict rules and strict supervision. It cannot be gainsaid that the concentration of the timber works would have facilitated and cheapened them, but the introduction of this measure would have sealed the warrant for the destruction of the Pegu forests, and luckily our champion of forestry in Burma was to the fore, and pointing out the fallacies in the arguments brought forward, saved the Burma forests for the time being, and secured them from all future attacks from that quarter. This was a worthy conclusion to a brilliant struggle, for otherwise Mr. Brandis' successful administration in Burma can hardly be called. The province has to be grateful to Mr. Brandis for the introduction of many further improvements, but his direct connection with the administration of British Burma ceased here, and his work as Inspector General will be noted in a second chapter.

NOTES FROM REWAH.

"Big game shooting in India is not what it was some few years since." The remark is not mine, but was made in my hearing by a glutton, who had just returned from the districts, where with one other gun, he had been spending a two months' shooting trip, and had brought back with him a bag of 24 tigers and one panther. Poor fellow, he was regretting not having made up the complete quarter century of the former.

Generally speaking, I suppose my friend was right, though his luck belied him, for doubtless the spread of cultivation and general opening up of the country has in many places caused the complete disappearance of game, while almost every-

where, the introduction of breech-loaders, the reduction in the price of arms, and the transfer of muzzle-loaders into native hands, have curtailed the chances of making a big bag. There are very few places now in India where five tigers can be accounted for before breakfast or tiffin, as we read of in Gordon Cumming's "Wild Men and Wild Beasts," or where 15 or 20 tigers can be shot in the season by one or two guns as many of us know to have happened. In the country where G. C.'s exploits were performed, and in or about which I believe he killed over 100 tigers, *stripes* is now nearly as uncommon as a kangaroo, and in other parts of Central India, where formerly large bags were made, it is now a difficult and expensive matter to get a glimpse of the noble quarry.

All this is very right, proper and humanitarian I suppose, and a sign of civilization and progress in which we should all delight and consent without murmur. But life in the forest will be a very different matter to many men in the future, especially to those in whom the old Adam is still stronger than modern culture, when big game shooting has become the monopoly of the *big-wig* and the *globe trotter*, and when the dreary monotony of camp life can no longer be made more bearable by the chance of sport. A good many of us, I expect, owe no little of our forest topographical knowledge to the British love of pursuit, to sundry long stalks after sambur, or to following up wounded animals through places, which, in ordinary inspections, would have escaped our notice. Those among us who know what it is to pass the balmy months of April, May and June under canvas in the plains, also know how greatly the discomfort of this dreary time is alleviated by carrying out a successful little campaign against the big game, and can imagine how wearisome those long hot days would be, were all chance of such distraction to become a thing of the past. Let us be thankful, therefore, that we live in the present, where excitement may still be obtained by the expenditure of a little powder and shoe leather, and amusement can go hand in hand with our work.

The shooting of this part of India, as elsewhere, has suffered from the introduction of more accurate weapons. Every Thakur, whose battery formerly consisted of a few rusty matchlocks, now owns one or more breech or muzzle-loading rifles, while some of the better off sport the latest workmanship of Lancaster and Henry; and as they all have an innate love of shooting, which they indulge, provided it can be obtained without laborious exertion, and as they also have no respect for age or sex, they have managed, by incessant driving, to clear the forests of sambur, chitul, nilghai and pig in all but the most inaccessible tracts. A good sambur head is an impossibility in Rewah, while cheetul have nearly disappeared altogether. And that this is entirely owing to the improved

weapons of the people, I have no doubt, for the Thakurs themselves readily attribute the present scarcity of game to this cause. Many of them can remember when the forests were comparatively well stocked with the above animals, when bison were common, and elephants by no means uncommon, and this in places where now one may beat all day and not see anything but a few pig or a melancholy nilghai.

Bison are still to be found, but only in the rains, and with much labour, and a few elephants also wander up into the south-eastern forests from the Chota Nagpore direction, but they are very restless and uncertain in their visits. The last capture of them was made by the late Chief about 15 years since, when 30 were caught, most of which, I heard, subsequently died of neglect while in training.

The above remarks, however, do not, to the same extent, refer to the larger carnivera. Panthers certainly are not numerous, but tigers and bears can still be obtained in Rewah, and large bags made of them at the proper time of year. Perhaps some "Foresters" may be interested in reading the following notes of a fortnight's shooting enjoyed by the writer during the latter portion of April last year.

I had chosen for my hunting ground the neighbourhood of the Banás, a considerable river which flows into the Sôn, well supplied with water, and situated in a country covered with small forest-clad hills, the forest consisting principally of *Shorea robusta* and *Dendrocalamus stricta*. It was also a favorite part of the country for graziers, whose large herds of cattle frequented the small swampy valleys of the sarai forest during the hot months.

My shikaries preceded me, and, on my arrival in camp, were able to report a "kill" about 7 miles off. It was already 10 o'clock, so some breakfast having been packed up we set out at once. On reaching the place we were told of a second "kill" which had only lately occurred, and the shikaries felt sure of the tiger. He was supposed to be lying up in a V-shaped patch of jungle situated between two small river beds, in one of which were a few pools of water. My post had been chosen at the junction of the two streams, to command both, and the "hank" were put in to drive up to this point, the flanks being guarded by men on trees at intervals. I was eager to get this fellow as being the first of the season, and inclined to draw omens from the result for the rest of the trip. The drive came on with plenty of row, tom-toms and cholera horns, and my eyes were aching with the glare and fatigue of keeping them fixed on one spot. Nearer and nearer they came, and I was thinking it was quite time for the tiger to appear. Nearer and nearer, until they almost arrived at the point of junction and I gave him up. But just when the beaters were approaching the apex of the jungle, where the cover was very thick, out he charged

with that short deep "hough hough" so indicative of mischief, and went through them like chaff, knocking one man over in his rush, but fortunately doing no harm. He went clean away. We searched for him on an elephant but without success, and had to return to camp disappointed and tired.

That evening news came in of two "kills" at a place called Keolári, 12 miles off, so a *sowar* was sent on at once to make arrangements for the drive next day. On reaching Keolári I was told there were a tiger and tigress, and that the beat was a well known one and easy to arrange for. We started at 1 P.M., and found a *machan* made on the bank of the Banás, along which the beat was to take place. Some *stops* were posted to command a few ravines on the landward side, the river being considered a sufficient obstacle on the other. We sat and waited, feeling comfortably sure of getting a shot this time, and indulged in mental pictures of bagging both the tiger and his spouse. The beat was long and tedious and about three parts over, when one of the *stops* on my right gave signs of the tiger's presence. The tapping on the tree, however, which should have turned him down towards me, was succeeded by coughs, shouts and at last by some decidedly high flavoured Hindustani, as the *stop* tried each in turn to prevent the tigers from breaking. But they were not to be denied, and cleared out of the beat at a lobbing canter, I just catching a glimpse of them, through the bamboos, as they disappeared along the river bank behind me. We got down from the *machan* and made a rush for it, hoping to cut them off, but were not quick enough, for they crossed the river about 300 yards ahead, splashing through in a clumsy fashion, and offering no chance of a shot. One of the Thakurs, however, fired a gun at random loaded with slugs, which appeared to pepper the big chap behind, for he kicked up his heels and hurried his pace in a most undignified manner. The forest on the far side of the river was so extensive, that a second beat was deemed impracticable, and after an hour's search up and down some of the nearest ravines, we reluctantly turned homewards heartily disgusted with our bad luck. The place where the brutes turned up out of the drive was not more than 50 yards from my position.

This was very unsatisfactory, three buffs killed and three tigers escaped. I went to bed that night feeling after all that tiger shooting was dreadful rot, and that only an idiot would give it any attention.

But my ill luck was not quite played out yet. The next morning I was to meet Baharat Singh, the *Talukdar* of Marwas, a thorough sportsman and good fellow, who had promised to assist me in his district, which commenced from the other bank of the river. I was bringing him a double barrel breech-loader he had asked me to purchase for him, and which I had picked up a great bargain at Allahabad. Well, early on the morrow, he

sent word across of a kill, and that arrangements had been made for a drive. I crossed the river at 12 o'clock and met him. He was delighted with the rifle, and told me there were no end of tigers in the neighbourhood. This was good news, my hopes began to revive, and I felt certain of getting the tiger that day. Baharat Singh, to make things perfect, placed the *stops* himself, putting his brother Pokur Singh, armed with the new rifle in the most important place, which indeed was the only place where the tiger was likely to break away, and he then went off to supervise the drive himself.

I was beautifully placed, could shoot right, left, and in front, and felt quite capable of hitting the tiger in the eye when he appeared, as of course he presently would. I was thinking whether he was likely to come over the rising ground on my right and offer me a head shot, or whether it would be more convenient to shoot him through the shoulder as he slouched past my front, when all these dreamy schemes were roughly dispelled by a shot from my right, where I knew Pokur Singh had been posted. My usual luck of course. Although the chances were 10 to 1 the tiger would come straight up to my tree, he had, on this occasion, gone towards P. S, and that worthy states, would insist on going past him in spite of taps, coughs, &c., and that he only fired when he saw he would not be turned in my direction. Oh! Pokur Singh! may you be forgiven. Was not the real state of the case that, having a new rifle in your hands, and finding the tiger coming towards you, offering a beautiful mark, you could not resist the temptation, but forgetting all about the unfortunate *Sahib* who had come out a hundred miles for this chance, you blazed away and shot the tiger so neatly, that we found him lying dead within 80 yards of your tree. That in my opinion is the true account of what happened, and I am inclined to think that some roughish language which passed between B. S. and his brother on the subject, showed that his suspicions jumped with mine. The tiger was a moderately big one, measuring 9 feet 5 inches as he lay.

Two kills being reported at Kota, 12 miles off, we marched next morning, taking breakfast with us, and arrived at the place where the buffs had been killed, before the trackers had come in from their morning work. Here we had a long hot wait under the trees, which, being small coppiced sarai, offered very little protection from the sun. But it gave one an opportunity of having breakfast and hearing all particulars regarding the tigers, kills, and probable line of beat. Presently, the trackers arrived with news of three tigers, and that all three had been marked down as having retired to a small hill about half a mile from where we were then sitting.

Arrangements were speedily made for the drive, my position being taken on the bank of a stream which flowed between

the tiger's hill and another, and which they would be obliged to cross during the drive. The hill in front of me was very rocky, and bare of vegetation half way up, but densely clothed with sarai coppice at its base. The drive commenced on the far side of this hill, and long before it had reached the top, I saw all three tigers climb over the rocks in front of me, following one another in Indian file, and enter the thick forest on the lower slopes of the hill. On came the beat, and on came the tigers until they arrived at the foot of the hill on the opposite side of the stream, and here they squatted, evidently afraid to face the open space between them and the hill behind me. Presently, as the drive pressed them, they attempted to break back, but were fortunately prevented, the Baigarhs of this part being very efficient beaters. The tom-tomming was re-doubled, the most excruciating corkscrew twisted notes were expelled from the cholera horns, and some blank cartridge was fired, which at last had the desired effect. One of the tigers broke cover and rushed across the open a little to my left, *howking* loudly, and giving me a nice side shot, which I could see took effect but did not stop him. A second one also broke, but on hearing my shot slunk along the nala bank on the far side. I knocked him over with the left barrel, but he was up at once and out of sight before I could give him the contents of the second rifle. No. 3 then broke back through the beaters and got away.

I had taken the precaution of placing some men behind me in case an animal went away wounded, and from one of these we learnt that the tiger first fired at had stopped under a tree a little distance from his post. On going there with an elephant we found him dead; the ball had taken him fairly behind the shoulder. The other fellow was also badly wounded, as was evident from the blood drops which were plentifully besprinkled and very obvious on the bright new leaves of the sarai, and eventually, after half an hour's careful tracking, which was rendered an easy business owing to the line travelling through very open forest, he was marked down by the Baigarhs as having entered a stony ravine with steep banks. Here we got off the elephant and climbed the ravine, keeping a sharp look out down below and opposite to us, and presently the tiger was spotted lying under an overhanging rock on the far side of the ravine. He was quite 80 yards off, and partially concealed by an aoula bush, and I could only make out his head, but fired, hoping that should I miss his nob, my ball would take effect elsewhere. The result was startling, for immediately after the report, the tiger fired at rushed up the ravine, while a second one that had been quite unseen charged out straight in front, taking us so unawares, that had it not been for the steep sides of the ravine, he would certainly have succeeded in interviewing us at close quarters, for he managed to get right under us before I pulled myself together and floored him

with a shot through the back, which effectually disabled him. This fellow turned out to be the wounded one, and the other must have been No. 3 which broke back through the beat and rejoined his comrade at a rendezvous well known to them, for on crossing the ravine we found the tigers had been lying at the mouth of a spacious cave, which from old and new marks was evidently one of their general resorts. My first shot had been a miss, as the mark of the bullet was visible on a rock close to where the tiger had been lying, and as no further drive was considered feasible that day, we padded the two animals shot and rode into camp. They turned out to be both tigers, measuring 9 feet 7 inches and 9 feet 5½ inches respectively.

The next day, there being no kills reported, arrangements were made to beat a range of hills for sambur. As regards the latter the drive proved a blank, but three bears broke close to where my horse and the elephant were waiting, one of them coming so near the former, that according to the syce and mahout he lashed out and gave the bear a sounding kick in the face. It was a very hot day, and the bears not being likely to go far, we reformed the beaters and posted ourselves on ahead. About the middle of the beat there was a loud cry of *bhálu, bhálu,* showing us the game was on foot, and soon afterwards two of them broke in front of Baharat Singh and myself. B. S. knocked his over dead, but although I had a close head shot at the other I failed to drop him, and bruin turned short round and disappeared in the thick sarai coppice before I could put in my second. When the beat came up, we heard that, early in the drive, one of the bears had broken back and mauled a beater who had pluckily, but rather foolishly, tried to turn him with a *láthi.* On examination, we found that the small bone of the wrist was broken, and there was a deep tooth mark in the forearm. The man behaved very well, and after being washed, bandaged and fortified with some Glenlivet, which I fortunately had out with me, was sent into camp to be further treated on our return.

Enquiries had elicited that the man had been attacked before the shooting commenced, and therefore by the unwounded bear. The one fired at by me had made his way to a small detached hill, which we now arranged to drive, and as the beaters were a bit unsteady, several of B. S.'s men, armed with matchlocks and *talwars,* were distributed among them. Bruin was there all right, and after a bit, not liking the infernal din in his rear, came out in my direction looking rather sick and carrying his head low. I let him come up to the rock on which I was standing, and then dropped him with a ball through the shoulders. My first shot, fired from a ·500 express, had made a large but quite superficial wound on the back of his neck. On return to camp, we made a rough splint for the wounded beater, and gave

him a bottle of carbolic oil for lotion, and this season had the satisfaction of finding that the treatment had proved successful.

Next morning, I went round to visit the buffs that had been tied up in the neighbourhood, but found them all untouched. On coming into camp however, we received news that a cow had been killed by a tigress some five miles off. Her ladyship was a nasty tempered animal by report, and although no man-eater, had killed two and wounded several villagers in a most unprovoked manner during the past year. She was well known to the graziers also, and voted a nuisance by everyone. The beat for her was arranged along a small stream, on one bank of which B. S. and I posted ourselves, placing *stops* along the other. The drive commenced, and almost immediately afterwards I saw the tigress a long way ahead slinking down the nala among the grass. She seemed a little beast not bigger than a panther, and she soon turned into the jungle and disappeared until a few yards in front of my *machan*, when instead of coming straight on, she turned off up the bank in the most provoking way, offering no shot until she arrived quite at the top, when, for an instant, she showed herself through some light bushes. There was only time for a very hurried shot, which however, the *stops* on the other side of the stream declared, took effect. But on climbing the bank we found she had disappeared, and although we traced her for several hundred yards, we found no blood marks, so, as tracking became impossible owing to the hard rocky soil, and I had all along the strongest doubts of my shot having hit her, we gave it up as a bad job. And herein we made a mistake, for her remains were found a few days afterwards within two miles of the place where she had been shot, and had we persevered in our search I should probably have got her skin, which, under the circumstances, proved useless. She had been shot in the stomach.

On getting back to camp we heard that a tiger had been seen drinking at a stream some miles off, and that he had afterwards gone into a small ravine which Baharat Singh knew and thought was well worth beating, so we all had something to eat and started away. A long hot tramp, especially for the beaters, poor chaps, who had already had rather a towelling in the morning.

The ravine was beaten and out came the tiger, but not near me or B. S., and, as the latter was eager for another drive, as he felt tolerably sure where the tiger had gone, we started for a patch of green sarai jungle about a mile off, and reached it just as it was growing dusk. There was no time for any thing but to cut a few branches and place them in front and around us as a screen, and just as we had arranged ourselves behind these and a clump of bamboos, the tom-toms commenced. I forgot to say we were on the top of a very low hill or rise. Presently, B. S. touched me on the shoulder and pointed

down the side of the hill, where I soon made out the tiger trying to slink away. The light by this time had become very bad, but he was not more than 50 yards distant, so waiting until he cleared a clump of bamboos I drew a bead on his shoulder and fired. But my ball, as I afterwards found out, missed, having struck an intervening bamboo, and immediately after the shot, the brute charged straight at us and came on with such a rush, there was no time for anything but blazing away in his face when he seemed actually upon us. The flash of our rifles fortunately turned him slightly, but so slightly that, instead of coming through us as I felt certain he would, he only brushed away some of the boughs that had been piled up around us, and he left us, for the moment, so startled with our narrow escape that we let him go without further shooting.

My belief is that the charge in our direction was quite an accident, for the tiger gave no tongue, and would scarcely have been turned from his course had he seen us and charged intentionally. My ball probably ricochéd from the bamboo and struck the ground in his front, thus turning him nearly at right angles to his original line, and bringing him *vis-à-vis* with us. It was also fortunate, I think, that neither of our second shots touched him, for had we only wounded him at such close quarters, the consequences would probably have been a severe mauling for one or both of us. When the beaters came up, they told us a second tiger had broken back through the drive. Altogether a most unsatisfactory day, but one that might have been worse.

The following day we had another beat for a tiger considered a certainty, but he broke through the *stops* and got off.

Then came two blank days, and then one on which I bagged a bear. Poor old fellow, we intercepted him before daylight on his return home from mowha grazing, and shot him as he scaled the rocks below us. He came on for a few feet higher, and then, relaxing his hold, rolled right down the hill, a pretty high one, and was found dead at the bottom.

And then came news, for a second time, of a kill at Nawria, 20 miles down the river, where I had sent a man at the commencement of the trip, so I parted from Baharat Singh and marched northwards, arriving at Nawria on the morning of the second day, where I heard of a third kill, and was informed, as usual, of the monstrous proportions of this particular beefeater.

A ravine running up from the Banás was to be driven, so I took up a position on a small mound nicely situated in the middle and near the head of the ravine. The tiger was bound to pass me either on the right or left, as the sides of the ravine were steep and lined with *stops*, who had been plentifully supplied with stones. It was a terribly long hot beat, but not uninteresting. First of all some jungle fowl came whizzing by, then a peacock, followed presently by a lumbering old bear, and

then came, sneaking up so close to us that we might almost have caught her with the hand, a prettily marked civet cat, with long sharp mobile nose, fierce little eyes and ears ever on the alert. And then came a lull, and then, just as I was cramming a sandwich into my mouth, for it was 12 o'clock, and I had eaten no breakfast, out slouched the tiger, looking, oh so lazy, hot and disgusted with the disturbance going on behind him. On he rolled up to the foot of the little eminence on which I was perched, when thinking he required a rest before proceeding farther, he deliberately sat down on his *hunkers* behind a small bush, and turned his head back in the direction of the beat. The position was good, all except the intervening bush, but I had a 12 bore in my hand, so taking a leisurely aim at his shoulder, I fired, and had the pleasure of seeing him roll over like a rabbit. By a curious fluke, my second shot struck him in the same spot as the first one. He died without grunt or moan, a short tailed very heavy tiger 9 feet 6 inches long.

Shortly after this, we heard a *stop* on the right tapping furiously, and thought there might be another tiger in the beat of which we knew nothing. The tapping was soon repeated on the left, and this was followed by a loud clattering, as a herd of spotted deer trotted up the ravine. Thinking that perhaps these had been the cause of the tapping, and it being my last day's shooting, I fired as they passed, dropping a young stag and wounding a better one, which we afterwards retrieved. However there was a second tiger in the beat after all, but the beast squatted on hearing all this firing, and when the beaters reached her, would certainly have done damage, but that fortunately they were preceded by a dog at which she made a vicious but ineffective rush, thus giving the men time to clear out of the nala, down which she at once skedaddled and so on out of the beat.

My time was now up. I was obliged to return at once to head-quarters, or I dare say I might have been still more successful. As it was, during the 10 or 12 days I was actually shooting, we had bagged 5 tigers, 3 bears and 2 spotted deer, and had done this in spite of more than a fair share of ill-luck or bad management.

J. M.

THE PAPER MULBERRY.

(*Broussonetia papyrifera*).

THIS interesting tree is hardly known beyond the limits of Botanical Gardens in India,* and as its bark produces one of the

* A specimen of *B. papyrifera* in the Forest School compound, Dehra, from seed sown in 1882 is now 1 foot 4½ inches in girth at 4 feet from the ground, and 25 feet 9 inches high.—[ED.]

strongest papers known, these few notes may draw the attention of arboriculturists to it. It thrives exceedingly well in the Botanical Gardens at Saháranpur, and will no doubt thrive in most parts of India. It is easily raised from seed sown in spring, or by cuttings made in the cold season, and plants raised in either manner will produce marketable fibre in their second year. This tree when full grown stands about 30 feet high, and when cultivated for its fibre is never allowed to grow into a tree, but is cultivated much in the same way as we grow osiers. The following extract from the "Treasury of Botany" illustrates the method of cultivation and manufacture of the paper adopted in Japan and South Sea Islands.

"The Japanese cultivate this plant very much in the same way that we grow osiers, and they use only the young shoots for the manufacture of paper; these are cut into conveniently sized pieces, and boiled until the bark separates readily from the wood, when it is peeled off and dried for future use. To convert this bark into paper, they proceed in the following manner:—The dried bark is first moistened by soaking for a few hours in water, all superfluous matter is then removed by scraping with a knife, after which the bark is boiled in a ley of wood-ashes until its fibres are thoroughly separated, when it is reduced to a pulp by beating with wooden batons; this pulp is then mixed with mucilage and spread upon frames made of rushes. The paper thus made is of a whity-brown colour, and very strong: it is in common use in Japan. Instead of paper the natives of the South Sea Islands manufacture from this bark an exceedingly tough cloth, called *tapa* or *kapa* cloth, which they commonly use for clothing, either plain or printed, and dyed of various colours. This cloth is principally made by the women, who adopt the following method of manufacture:—The bark is first softened by being soaked in water for a considerable length of time: it is then placed upon a log of wood and beaten out with a baton until it is of the requisite degree of fineness; the baton is made of very hard wood, and has four flat sides, each of which is sharply ribbed. Two or four women usually work together, and as they keep time in beating, the noise they make is loud and musical. In some islands, however, another and inferior method is adopted, the bark being placed upon a flat board, and scraped with different kinds of sharp-edged shells while kept constantly wet. By employing mucilage obtained from the arrow-root, the natives join pieces of cloth together, and Admiral Sir Everard Home states that the King of Tongataboo (one of the friendly islands) had a piece made which was two miles long and 120 feet wide." This extract shows that the fibre is a very useful material, and if a plentiful supply of it were always obtainable, it is hard to say where an end of its usefulness might be found.

W. G.

DEMARCATION BOARDS.

TO THE EDITOR, "INDIAN FORESTER."

SIR,—I am much obliged to those gentlemen who have written about demarcation of forests in answer to my letter on the subject.

How that poor young man's soul (TULDA BANS') must gradually be being torn in pieces with conflicting emotions if he does not know whether to laugh or cry at every attempt which is made to outwit nature.

Boards, for all that has been said, are not satisfactory, and it has been proved that they require renewing or rather refixing in many cases after 3 years. Possibly in dry forests where the growth of trees is slow they may last longer, but they will not do so in moist forests, where the growth of trees is very fast, unless some other plan of fixing them on trees is adopted. I am going to give TULDA BANS a chance of spending another unhappy five minutes by suggesting that the demarcation of forests, in many parts of this Province, should be done with galvanized iron plates about $12'' \times 4'' \times \frac{1}{8}''$, with numbers stamped out after the manner of stencil plates, these to be fixed on trees with an 8 inch nail, 3 inches to be driven into the tree (heartwood), and the 5 inches left exposed with plate hanging on. These plates would be less heavy and cumbersome than the present boards, and an elephant could carry a great many more, which is a great consideration in a country where the native howdah is so small; at present it is with difficulty that a Karen howdah will pack more that 80 boards, so that to demarcate any large tract of country several elephants are required to carry the boards alone; another thing is that no elephant can get along several portions of the boundary of a reserve, and the boards have to be carried by coolies, these beasts of burden are in the first place very difficult to obtain, and when obtained can carry very few boards, whereas they would be able to carry a goodly number of plates. The plates should be painted white, and the numbers would then show out well. I believe that under this system the necessity for the renewing of boundary marks might be put off *ad infinitum*. The initial expense would be greater, but the difference in the demarcation expenses of a reserve demarcated with boards and of one demarcated with plates, would in 20 years be very much in favour of the latter; the hole in the plate should of course be at the top and not in the middle as at present in the boards.

TAVOY BRITISH BURMA,
15th May, 1884.

C. W. PALMER.

PUNJAB WHEAT.

FULL information regarding wheat cultivation in the Punjab is to be found in a pamphlet recently issued from the office of the Commissioner of Agriculture, Lahore. It appears that in 1883 the Punjab Government caused enquiries on the subject to be instituted in the various districts of the Province, and the replies to these enquiries, together with carefully tabulated statements, form the subject matter of the pamphlet. About 7,000,000 acres of land are under wheat cultivation in the Punjab, 5,000,000 acres being devoted to the production of "soft red" wheat (a well known and hardy variety), while of the remainder most is sown with white wheat. The latter is in chief demand for the European market, and it is a question of some importance how to stimulate its cultivation. Increased demand will do much, but greater facilities of irrigation will do more; for white wheat requires for its growth an abundant supply of moisture, whereas the hardier red wheat can be cultivated on unirrigated land and needs little or no manure. The chief disadvantages with which the export trade of wheat from the Punjab has to contend are to be found in the ineffective methods which obtain of harvesting and storing the grain, in the neglect of means for cleaning it before despatch to the seaboard, and in the frequent practice of mixing and adulterating grain which is intended for the market. It is impossible to hope that these defects can be remedied by any direct action on the part of Government. Rather it must be left to the shrewdness of the dealers and cultivators themselves to take measures for improving the trade in which they are engaged.

CASHAW.

(*Prosopis juliflora*).

TO THE EDITOR, "INDIAN FORESTER."

SIR,—WITH reference to the extract from the last report of the Agricultural Society of India contained in your number for June, it may not be generally known that seeds and plants of this tree have been extensively distributed from the Saháranpur Botanical Gardens within the last few years under the name of "Mesquit Bean." I can fully endorse all Mr. Morris says in praise of it, except its value as a timber. The Saháranpur plants are six years old, and are bushes with a loose straggling habit, from 15 to 20 feet high, but with no appearance that would lead one to suppose they will grow into trees from 40 to 60 feet high, and produce marketable timber. The pods are produced abundantly during the hot months, when other fodders are scarce, and as it thrives in the poorest of soils, these qualities are suffi-

cient to recommend it for extensive planting in this country. The seeds from which the Saháranpur plants were raised were received from America, and it is quite possible they were the produce of a shrubby variety of Cashaw. The seeds now being sent by Mr. Morris from Jamaica may be a variety which, in addition to being a good fodder, is also a good and useful timber tree.

W. G.

STAVES FOR BEER CASKS.

WE have been informed that from the 1st January, 1885, all beer used by troops in the Bengal Presidency will be supplied by Indian Breweries, and probably 30,000 hogsheads will be required annually. As importing oak staves from Europe is very expensive, it would be a great saving to the Indian Brewers if any species of Indian oak, or other wood, could be utilized for staves, and we recommend this subject to the attention of our readers.

The following letter from Messrs. Laurie and Co., of London, to Messrs. Mackinnon and Co, of Mussoorie, has been kindly placed at our disposal, as it gives the dimensions and prices of staves at the principal European marts :—

DEAR SIRS,—We are in receipt of your letter of 13th May on this subject, but having just received particulars, are unable to send to-day costs delivered at Calcutta or Bombay. Bosnia Dantzig or Memel staves would suit your purpose, possibly Bosnia the best, as this size is most suitable, the stave being 37 at 40 inches long, a full inch thick, and 4¾ at 6 inches wide for sides, and 24 at 28 inches long, same thickness and width for heads. The price for side staves has ranged from £27 10*s.* at £30 per mille of 1200 pieces, present price being £29, and for heads £16 10*s.* at £17 10*s.*, the latter being current market price.

Dantzig and Memel side staves are 40 at 42 inches long, 2⅛ at 2¼ inches thick (double Bosnia staves), and 4 at 4¾ inches wide, prices ranging from £42 10*s.* at £45 per mille of 1200 pieces, present price being £42 10*s.* Head staves are 3 inches thick, length say 24 at 28 inches, and width 4 at 4¾ inches, with prices in proportion.

The staves should be in two lengths, 40 to 42 inches long, by 4½ to 6 inches broad for *sides*, and 24 to 28 inches long, by 4 to 4¾ inches for heads, the thickness of both sides being *a full inch.*

For each hogshead 18 to 20 side staves will be required, as well as 8 head staves.

We will let you know next mail more definite particulars as to cost landed at Calcutta.

For a 5,000 or 10,000 hogsheads order at one time, there might be a small reduction in cost, of say about 2½ per cent., but more time would be necessary in collecting the larger quantity.

14, St. Mary Axe,
London, 6th June, 1884.

THE FOREST DEPARTMENT AND ENSILAGE.

TO THE EDITOR, "INDIAN FORESTER."

SIR,—The Forest Department having been entrusted almost generally with the management of grazing and fodder reserves, its officers will naturally be on the look out for methods by which the efficiency of these reserves can be increased. Allow me to suggest to them the expediency of utilizing the new system of ensilage, which has already been tried with conspicuous success in India. In almost all forests and waste lands grass is found in the greatest abundance, but hitherto by far the larger proportion of it has been wasted. There should be no need for any such waste in future. Whenever there is a demand for fodder, and such demand is nearly universal, the jungle grasses which spring up in the rainy season should be cut down and siloed in all convenient localities. The 15 feet high jungle grass, which when mature, is more of a nuisance than anything else, is, when 3 or 4 feet high, capable of being made into nutritious and valuable fodder. It should be cut when at this height, and two crops (of which the second will be far heavier than the first) can be cut before the rainy season is over. The grass so cut should be stored in pits dug in the ground. It should be well trodden down, and when the pit is full the excavated earth should be piled upon the top and evenly sloped off towards the sides. The covering of earth should be 4 or 5 feet thick, in which case a pressure of 250 or 300 lbs. per square foot will be obtained. There is no danger of such a silo breaking or giving way, and I am informed on good authority that it is impossible for such a silo to be a failure. It is immaterial to have the pit quite dry, for the grass may be put in when dripping with wet, and indeed moisture seems to be rather an advantage than otherwise. The only essential is that the pit when filled and closed should be absolutely air-tight, and this is a result easily obtained.

A silo made by digging a pit in the ground can be constructed at a nominal cost, and by the most unskilled labour. The size can be regulated according to circumstances, but a pit 20 feet long, 10 feet broad, and 8 feet deep, is a convenient size, and will contain from 80 maunds to 100 maunds of ensilage. The pit should be made wider at the top than at the bottom so as to facilitate packing. Forest lines would form convenient sites for silos, the position of the latter being regulated by the quantity of grass available and the distance from which it has to be carried. Two sets of silos could be filled, the first in July or August, the second in September or October, and they should be opened in the dry season whenever the demand for fodder arises. The ensilage produced forms excellent food for horses, cattle, mules, sheep and goats, and is far superior to the

innutritious rubbish with which most of such animals have to be content in the hot season. Ensilage can be sold in the market for 12 annas a maund, but even if the price were much less than this, a silo would be a profitable concern. In any case it seems to be the duty of the Forest Department to make the experiment, and the benefits to be obtained from carrying it out successfully can hardly be over-estimated. I leave the matter to the consideration of your readers.

J. S. C. D.

OBITUARY.

We have received the following from an Assam Correspondent :—

I regret to have to report the death of Mr. Edgar Ludlow, Assistant Conservator of Forests, at Gauhati, from cholera, on the 13th instant, after a few hour's illness.

Mr. Ludlow applied for sick furlough in April last, and was granted 10 months and some odd days, and he was informed that he was due no more. Conscious that there was some mistake, and knowing how difficult it would be to rectify such matters from England, Mr. Ludlow decided on staying at Gauhati until necessary references to Simla and other places could be made. He had just received the pleasing intelligence that he was entitled to the full period of two years' furlough, and was only awaiting necessary rectification in the Gazette prior to proceeding home, when he was seized by cholera and died in a few hours.

Mr. Ludlow's career in the Forest Department was a chequered one, and it is difficult to say whether he was more sinned against than sinning. His polished manners, his generous kindness of heart and other amiable qualities, made him a great favorite in general society, and his death is regretted sincerely by all who knew him in Assam.

Note —With all due respect for the dead, we cannot but think that Mr. Ludlow's conduct in withholding reports, and not carrying out orders, has been very leniently dealt with.—[Ed.]

II. Reviews.

REVIEW OF THE FOREST ADMINISTRATION IN BRITISH INDIA. By W. SCHLICH, Ph. D., INSPECTOR-GENERAL OF FORESTS.

We give below numerous extracts from this review, which should be of special interest to all Indian Foresters, and indeed to every one who has the welfare of forestry at heart, for it marks an era in the progress of the Forest Department which, having secured the most valuable forest areas in the country, will now make every effort to work them in an efficient manner.

The introduction we quote in full.

The most remarkable feature in Indian Forest Administration is the rapid increase of the revenue. Five years ago it amounted to 68 lakhs of rupees, and now it has risen to 104 lakhs. This proves conclusively an increasing demand on the Government forests, which is chiefly due to the destruction of private forests brought about by—

(i), the extension of railway communication; and

(ii), the increasing prosperity of the country.

Repeated efforts have been made to ascertain the area of private forests, but the data so far available are very incomplete. In the Central Provinces the private forests amount to about 35,000 square miles, while the Government forests cover an area of close on 20,000 square miles. In Bengal the zamindars hold from 40,000 to 50,000 square miles of forest lands, while the Forest Department manages 11,754 square miles. In other provinces the Government forests exceed the private forests in area; but on the whole it seems that the latter cover a larger area than the former.

The private forests have for a number of years past, and, it may be said, since the occupation of India by the British, which event was counterminous with the springing up of an increased demand, been steadily reduced by indiscriminate fellings without any regard to their reproduction. In some cases the object was to clear the ground for cultivation, and in others to satisfy an ever-increasing demand for forest produce Where railways have been constructed the forests have rapidly disappeared, not only to make room for the march of civilization, but also to supply the large requirements of the lines. Taking into consideration the special impetus which has lately been given to the construction of additional railways, the final destruction of all private forests within a reasonable distance from them may safely be predicted. The result of this change is that the requirements for forest produce, which were formerly chiefly satisfied from

private forests, must in ever-increasing proportion, be obtained from the Government forests. Hence the rapid increase in the revenue.

This state of affairs imposes additional duties upon the officers of the Forest Department. As long as the bulk, or, at any rate, a very large proportion, of the ordinary forest produce required per annum could be obtained from private estates, and while the Government forests were in most instances worked below their capability, a simple system of management sufficed to keep the latter estates in a fair condition; but with the increase in the demand on them, and as this approaches their maximum annual yield, the system of management must become more detailed and resources must be more carefully husbanded, or else it may hereafter be found impossible to meet the demand upon the forests.

Forest estates are properties requiring special and peculiar treatment, and in this respect they differ widely from land under ordinary cultivation. In the case of forests the produce of a particular year cannot, as a rule, be removed at once, but has generally to be kept for many years before it becomes fit for the special purpose for which it is wanted. The Forest Officer thus becomes trustee of considerable capital, on which he may, by overworking the forest, make inroads for a long period without the fact coming to the knowledge of the Government, or becoming even apparent to himself, unless a careful account is kept of the growing stock, and sales are duly regulated with reference to the capabilities of the forest and its powers of reproduction. As regards the latter point, special care must be taken to effect a re-stocking of all areas cleared for the market in the shortest time practicable. Where circumstances are favourable, this may be done in the natural way; but under unfavourable circumstances, planting and sowing must be undertaken to augment the efforts of nature, in order to prevent loss of time and a reduction of the possible yield of the forest. All these things demand that a strict control should be exercised over the working of the Government forests, and this can only be done by means of working-plans, which should be prepared, at first, for the more important areas, but eventually for all forests.

A working-plan deals with all points connected with the management of a forest, amongst which the following are the most important; it ascertains—

(i), the stock on the ground at a particular time;
(ii), the annual increase of the stock;
(iii), the quantity of material which may be removed annually; and
(iv), it arranges for the proper and immediate re-stocking of all areas cleared for the supply of the market.

The degree of accuracy required in the collection of the data for a working-plan depends chiefly upon the market value of the produce and the demands made on a particular forest. Where that demand equals, or even exceeds, the possible yield, the work must be done with the greatest minuteness, and everything must be arranged so as to obtain the highest yield which the forest is capable of returning under the most careful management. Where, on the other hand, the demand is as yet below the ordinary capability of the forest, a more

rough procedure may be followed. Thus a working-plan for the greater portion of the Assam forests should, for the present, be a very simple and plain document, while those for the Darjeeling, Chakrata, Kalatope, and other similarly situated forests, must be drawn up much more minutely.

For years past the preparation of working-plans has been encouraged. Whenever the Inspector-General of Forests has visited a province, he has generally drawn up a scheme for the working of its forests, and a number of special working-plans have also been prepared from time to time either by the Inspector-General himself or by local officers. Then as the working of the forests gradually became more detailed, owing to increased demands, special working-plans divisions were established, first in the North-Western Provinces, after that in British Burma, and lately in the Punjab. Similar divisions are about to be formed in some of the other provinces. In this manner a skilled staff will gradually be created, whose business it is to prepare, in consultation with the local officers, the working-plans for the forests in the different provinces.

But something more is required, namely, that the execution of the working-plans, once approved by Government, shall be ensured, and this had best be done by a central agency. For this purpose a Superintendent of Working-Plans has been sanctioned, who will now be appointed Assistant to the Inspector-General of Forests. It will be the duty of the Inspector-General and his Assistant to visit the provinces where working-plans are under preparation or revision, to advise the officers in charge of the work regarding the general lines on which it should be conducted, and, after orders have been passed on the working-plans, to watch their execution, so as to bring any unauthorized deviation to the knowledge of the Local Government.

Although the importance of working the Government forests on rational principles and to the greatest advantage has made itself specially felt during the last few years, it was the knowledge that this state of things must come about which induced the Government many years ago, guided by the counsels of their late Inspector-General of Forests, to procure gradually a staff of Forest Officers skilled in the science of Forestry, as practised in those European countries where rational forestry has been part of the general administration for a long time past. Many excellent officers joined the staff of the Department when first started, who, though untrained in forestry at the outset, have done really good work for Government, and who have become thorough administrators. Indeed, of the 15 Conservators of Forests at present controlling the forest administration in the several provinces of India, not less than 11 belong to this class of officers, and without the administrative ability which they brought to bear upon the business, it would have been impossible to build up the Department. The preliminary part of the work, the demarcation and settlement of the forest estates, approaches, however, completion, and their management according to rational principles must now be worked out in detail. Hence the necessity for a specially skilled agency. For the professional education of the superior staff, arrangements were made as early as 1866, and up to date 79 officers trained in France and Germany have joined the Department in India. It is

now contemplated to make the Department to a considerable extent independent of foreign countries, and to start a Forest School in connection with the Coopers' Hill Engineering College in England.

An equally important subject is the training of a staff of executive officers ordinarily called Rangers Until quite lately the executive officers were recruited from a variety of sources. Some entered as Forest-Guards, and by hard work and elementary study, made their way up to the rank of executive officers; but the majority of them entered through the channel of office establishments, or they were appointed direct from elementary schools or from other employment The difficulties of obtaining an efficient staff of these officers were very great, and they increased year by year. Under these circumstances, the Forest School at Dehra Dún was started in 1878; it commenced by giving a practical training, but a course of theoretical instruction was added in the summer of 1881. At the outset the instruction could only be given in the English language. The students of the English class must have served for at least twelve months as Foresters, and they must have passed the Entrance Examination of an Indian University. If they pass successfully through the School, they leave with the Ranger's certificate, and they are ordinarily appointed as Rangers on return to their province. The exclusion of students who are not acquainted with English was the result of necessity at the outset, which was only to be maintained until arrangements could be matured to teach also in Hindustani. A class of the latter kind is now about to be started, but as the instruction can as yet be only of a very elementary nature, this class will be one for the training of Foresters, who, after their return from the School, can qualify for promotion to the rank of Ranger by further practical service of not less than two years. Arrangements have been made to admit to the Forest School 30 students annually, and this number will be wanted to meet the ever-increasing requirements of the Department.

Thus arrangements have now been matured to procure a staff which can regulate the working of the forests according to rational principles and the lessons taught by forest science, and another staff of executive officers who can be entrusted with the actual execution of the working-plans. Both classes of officers are essential if the Department is to fulfil its mission, and it is to be hoped that nothing will occur to interfere with the proper and suitable training of either the one or the other.

On the whole, Forest Conservancy in India is now fairly secure. This result has not been achieved without difficulties and opposition. In most cases the people had been accustomed to roam at their pleasure over the Government Forest Estates, and to cut where they liked and in the most improvident manner. A considerable reluctance to interfere with that state of affairs existed. But as the real necessities of the case and the interests at stake became more and more manifest to the enlightened rulers of the country, it was recognized that endeavours must be made to prevent a further destruction of the forest property of the State, by regulating the use of the forests without depriving the people of the forest produce required for their domestic arrangements. After a protracted struggle these

wise counsels have prevailed, and the permanent preservation of a considerable area of forest lands has now been placed beyond doubt. Forest conservancy has been recognized as an important part of the general administration of the country, and the labours of those who have struggled for this result have not been in vain. The successors of the pioneers of the Department must now do their duty by constantly improving the management of the estates which they hold in trust, and thus render them an everlasting and increasing benefit to the general community. To derive the greatest possible benefit from these estates with the smallest possible inconvenience to the people must be the watchword of every Forest Officer in India.

The totals of Reserved and Protected forests compare as follow with those of the previous year:—

Year.	Area, in Square Miles.		
	Reserved.	Protected.	Total.
1882-83, ...	48,272	8,570	56,842
1881-82, ...	46,213	8,612	54,825
Increase in 1882-83, ...	2,059	...	2,017
Decrease in " ...	...	42	...

The total results of fire-protection during the last five years in the Bengal Presidency are as follow:—

Year.	Area, in Square Miles		Percentage of failures to area attempted.
	Attempted.	Actually protected.	
1878-79, ...	3,474	2,938	15
1879-80, ...	4,072	3,709	9
1880-81, ...	4,465	4,194	6
1881-82, ...	4,897	4,283	13
1882-83, ...	4,826	4,562	5
Average, ...	...	...	9

The average failures during the last five years amounted to 9 per cent. of the area under protection, which shows an improvement of 3 per cent. as compared with the quinquennial average shown last year.

In Madras the protection was attempted of 609 square miles, 569 being successfully protected, but the data for Bombay are incomplete.

Owing to the vast extent of the Indian forests and the high cost of artificial operations, the natural system of reproduction must

be chiefly relied on; that is to say, the forests must be properly protected, fires kept out, and, whenever necessary, certain areas must be closed against grazing, either altogether or for certain seasons of the year, until the young growth in the areas under reproduction is no longer liable to be injured by cattle. In many instances, however, natural reproduction will have to be assisted by sowing and planting, if the duration of reproduction is not to be indefinitely prolonged. Where seed trees are wanting, and where the introduction of new species is desired, artificial reproduction must, under any circumstances, be resorted to. Under these circumstances, it will always be difficult to classify the reproductive works. An attempt should, however, be made in future Annual Reports to do this in as satisfactory a manner as the circumstances of each province will permit.

The remarks on natural reproduction recorded in the reports for 1882-83 are, as a rule, of too general a description to be of much use. In future reports this subject might usefully be dealt with in detail, by recording the progress made in each closed block. Closing against grazing and fire conservancy are expensive and often necessitate the enforcement of restrictions on the people, and it is essential that the results of these measures should be ascertained and recorded in detail, to enable the Government to judge how far they have led to results which are commensurate with the means adopted, and how far artificial reproduction is necessary in each case where natural means have failed, or are unlikely to accomplish the re-stocking of the areas under reproduction within a reasonable time.

The area of plantations may be seen from the following table:—

Province	Area, in Acres			
	At the commencement of the year.	Added during the year.	Excluded during the year.	At the close of the year.
Bengal, ...	2,005	434	...	2,439
N.-W. Provinces and Oudh,	3,330	281	...	3,611
Punjab, ...	16,201	188	...	16,389
Central Provinces, ...		Not	given.	
British Burma, ...	10,100	1,121	...	11,221
Assam, ...	1,151	111	...	1,262
Coorg, ...	437	152	...	589
Ajmere, ...	413	...	58	355
Biluchistan, ...	13	8	...	21
Total, ...	33,650	2,237	...	35,887
Berar, ...	1,409	901	...	2,310
Total Bengal Presidency,	35,059	3,138	...	38,197
Madras, ...	...	...	...	62,949
Bombay, ...		Not	given.	
Grand Total, ...	...	...	...	101,146

It was the practice in former years to give the expenditure incurred on plantations, but some of the areas have already yielded large returns, the value of which cannot be gathered from the provincial reports. Under these circumstances, it would be misleading to give the expenditure only, and the column in question will be omitted until it is possible to give also the receipts.

The largest amount of actual plantation work has been done in Madras and next in the Punjab, while the *toungya* teak plantations in Burma are now being so rapidly extended that the total area planted in that province is likely to surpass, at an early date, the area of plantations in the Punjab. In Bombay a great deal of sowing is done to assist natural reproduction, but these operations cannot be shown in the above table.

The receipts and surplus of the various provinces during the year under review, arranged according to the total amount of revenue, are as follow :—

No.	Provinces.	Total Revenue.	Surplus.	Deficit	Proportion of Surplus to gross Revenue in per cent.
		Rs.	Rs.	Rs.	
1	British Burma, ...	25,03,894	12,74,935	...	51
2	Bombay, ...	20,90,353	8,32,594	...	40
3	N.-W. Provinces and Oudh,	10,13,403	1,74,378	...	17
4	Central Provinces, ...	9,77,647	5,65,399	...	58
5	Madras, ...	9,06,442	2,61,577	...	29
6	Punjab, ...	7,66,710	2,05,959	...	27
7	Bengal, ...	6,93,959	3,11,775	..	45
8	Berar, ...	2,87,043	1,37,011	...	48
9	Assam, ...	2,48,605	76,782	...	31
10	Coorg, ...	1,38,022	73,240	...	53
11	Ajmere, ...	7,126	...	4,158	...
12	Biluchistan, ...	5,039	...	6,922	...
13	Forest Survey, ...	348	...	41,247	...
	Total, ...	96,38,591	38,61,323	...	40

Burma still stands first as regards gross revenue and surplus; indeed, there has been, owing to the favourable prices obtained for teak, a further considerable improvement in both, as compared with the previous year, the receipts having increased by about three lakhs and the surplus by two lakhs. In Bombay also a considerable improvement has taken place, owing to an enhanced demand for produce, while smaller advancements have been effected in the Punjab, Bengal, Assam, and Berar. Madras, which stood seventh on the list for 1881-82, has now advanced to the fifth place, chiefly owing to

the amalgamation of the Jungle Conservancy with the Forest Department. In the Central Provinces a considerable falling off has occurred, which is due to reductions in the departmental operations. The changes in the North-Western Provinces and Oudh are small, the receipts being slightly lower and the surplus somewhat higher than in the previous year.

The total forest revenue in the year under review amounted to 96 lakhs of rupees. According to the latest figures for the year 1883-84, the receipts have risen to 104 lakhs, which is a further increase of 8 lakhs as compared with 1882-83.

The proportion of the surplus to the gross receipts in 1882-83 is 40 per cent., as compared with 37 per cent. in the year 1881-82.

The surplus revenue has shown a steady increase during the last five years, as may be seen from the following figures :—

Year	British Territory				Berar	Grand Total.
	Bengal Presidency	Madras.	Bombay.	Total.		
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
1878-79, ...	12,29,982	41,890	1,82,732	14,54,604	1,78,320	16,32,924
1879-80, ...	15,96,541	*15,478	4,68 399	20,49,462	1,96 987	22,46,449
1880-81, ...	18,27,836	1,49,835	4,07,711	23 85,382	1,37,587	25,22,969
1881-82, ...	23,08,254	1,15,524	6,79,631	31,03 409	80,526	31,83,935
1882-83, ...	26,30,141	2,61,577	8,32,594	37,24,312	1,37,011	38,61,323

* Deficit

ANNUAL REPORT OF FOREST ADMINISTRATION IN AJMERE AND MERWARA FOR 1882-83.

We have before us the Annual Report of Forest Administration in Ajmere and Merwara for 1882-83.

The report of the progress made is on the whole satisfactory, considering the difficulties with which forest operations had to contend in that aerial region.

It may not be generally known that when the idea of forming forest reserves in Ajmere was first put into force during 1872, it was found that with the exception of about 2,500 acres of nazúl property, not an acre of the waste lands could be obtained for forest purposes, and it was only after every effort to induce the zamindars to agree to forest conservancy arrangements had failed, that it was at last decided to take up the waste lands under a special law, called the Ajmere Forest Regulation.

This mode of procedure necessitated the granting of very extensive privileges in the matter of grass, fuel, &c., to the original occupiers of the land, and the exercise of which privileges has of course greatly tampered and retarded forest operations.

The curtailing of grazing and wood cutting privileges of course caused great discontent at first, but in a few years the stock of grass increased so enormously that the zamindars, at least in the neighbourhood of large towns, soon found the profits to be obtained from the sale of cut grass considerable, also the plan of stall feeding a certain number of cattle was gradually introduced, and was found an advantage over the plan of allowing all the cattle to wander over the barren hill sides, where at the best they only picked up a precarious sustenance.

In addition to the difficulties which had to be contended with in obtaining the necessary control over the waste lands, and the steady opposition of the people at first, the climate is very unfavorable for forest growth, the annual average rainfall being only 22 inches. Owing to the extremely denuded nature of the hills where operations were commenced, and to the fact that Government was somewhat impatient of results, it was considered necessary to start pretty extensive planting and sowing operations, also the construction of small tanks and bunds to retain the scanty rainfall in the forest reserves was tried, all of which operations, though fairly successful, naturally cost a good deal of money. These works were, therefore, gradually discontinued, because it was soon found that nature was capable of repairing the damage done in a very rapid manner, if the hill sides were only protected from fires and the grazing of all kinds of cattle. Some of the tracts which were as bare as a billiard board in 1872 when operations were first commenced under the superintendence of Mr. A. Moir, became in the course of four or five years covered with a dense growth of shrub and grass, which kind of jungle, though probably looked down upon by those accustomed to the teak forests of Burma or the deodars of the Himalaya, is of great value, especially from a climatic point of view, in arid countries like dry Rajputana.

The successful results of forest conservancy is also mainly due to the fact that the forest officers in Ajmere have acted directly under the orders of the Commissioner, Mr. Leslie Saunders, who has always exercised a fostering care over forest operations.

The principal species which form the natural growth of the Ajmere and Merwara Forests, are Dhankra (*Anogeissus pendula*), Khair (*Acacia Catechu*), Kumta (*Acacia rupestris*), Jhinga (*Bauhinia racemosa*), Saler (*Boswellia serrata*), and various other thorny trees and shrubs, all of which coppice well, so that there is no difficulty about reproduction when the forest is cleared, if only protection is afforded.

The area of the reserves at present under protection is stated to be 77,875 acres, and the results of forest conservancy have been considered so successful, that Government have decided to increase the reserves by about 11,460 acres, which will bring their area up to about 100,000 acres.

The number of prosecutions for breaches of the forest rules, also the numbers of cattle impounded, have greatly decreased during the year under report, from which facts the conclusion may be drawn that the zamindars are becoming accustomed to forest restrictions.

The fire conservancy arrangements seem to have been conducted in an economical and efficient manner by Mr. Lowrie, Assistant Conservator, the officer at present in charge; only two areas, aggregating 13½ acres, having been burnt, which in the dry inflammable forests of Ajmere, may be considered as most successful.

The writer of the report seems to be somewhat discouraged at the dying down of certain species, the seeds of which were sown during the rains in pits and ploughed patches. This, however, invariably happens during the earlier stage of the growth of certain trees in dry climates, but it is found that the plants again spring up in the following rains, which process goes on for several years, till the roots become so strong and have penetrated to a considerable depth into the soil, when finally they throw up such vigorous shoots as enables them to establish themselves.

It is also satisfactory to observe that some of the tracts in the Merwara District have so far recovered from their former denuded condition that horned cattle have been allowed to enter and graze in them during the hot weather, and this must be a great boon to the neighbouring zamindars, even though small grazing dues are charged.

But perhaps the most successful results of forest administration in Ajmere and Merwara is in the financial results, the revenue during the year under report having been Rs. 7,126. This is of course trifling when compared with the enormous forest revenue of Burma or Bombay, but taking into consideration that the revenue for the year 1872-73, when operations were commenced, only amounted to about Rs. 10, I think every one will admit that this result is highly satisfactory.

Since the report of 1882-83 was written, it has been discovered that a considerable number of Sandal wood plants are springing up naturally in two of the reserves, the seeds having been apparently carried there by birds and squirrels from some old trees planted years ago in certain neighbouring gardens or topes. It is perhaps needless to remark that if this natural growth of Sandal developes itself, and this valuable species can be got to grow over any considerable areas, the success of forest operations in Ajmere and Merwara from a financial, as well as from economical and climatic points of view will only be a matter of a few year's careful developement, and we venture to predict a golden future for the first real attempt at "reboisement" operations made by the Government of India.

III. Notes, Queries and Extracts.

A Great Discovery in Fruit Culture.—Pure food makes pure blood, and no food is so pure as fruit. An abundance of fruit ensures the health and prosperity of the people. No crop is so rich and productive. Few objects in nature are so beautiful as a fine tree adorned with blossoms in spring, or laden with fruit in autumn. Our troubles have been that the proper culture of fruit has not been understood, and that our gardens and orchards have therefore been uncertain and often unproductive. The science of Fruit Culture has not existed. Its discovery, just now, we consider one of the most important events of this century of great discoveries—really more important than the discoveries of steam and electricity. The new method of fruit culture, or more probably a revival of an old one known and practised perhaps for ages in China and Japan, comes to us from North Wales in a letter by Mr. E. K. Kynaston, and an illustrated pamphlet by "Head Gardener," the pseudonym of Mr. Kynaston, entitled, "Out-door Fruit for the Million. How to grow it in large and continuous quantity by simple and inexpensive means," with the motto—"Who loves not fruit, ripe glorious fruit—a priceless boon from the great Creator's hand?"

Mr. Kynaston, who modestly calls himself "Head Gardener," appears to be a gentleman of education and property, who has devoted himself to fruit culture with the enthusiasm of a discoverer and benefactor. If the man who makes two blades of grass grow where one grew before is a benefactor, what shall we say of Mr. Kynaston?

At the opening of his pamphlet Mr. Kynaston tells us that after long years of practical horticultural experience he succeeded in growing English fruits in unprecedented quantities, continuously, by simple, inexpensive means. He was always his own head-gardener. Living on property of his own, after some experience abroad, he planted more than twenty years ago a choice and varied selection of fruit trees. He says:—

"In about three years' time the young trees commenced bearing, and have borne from that period annually increasing crops, until at last the fruit hung for thickness like leaves upon the trees; and shelf after shelf, closet after closet, room after room had to be devoted to its storage and preservation.

"In the autumn of 1875, the garden being as usual loaded almost to its utmost, the writer hand-picked himself three trees to ascertain the exact count of fruit upon each. The tree (a

dessert pear of excellent flavour), nailed to a wall 7 feet high, yielded 704 marketable pears. The second tree, also a pear, somewhat larger than the first, yielded a count of 748, and as the fruit was of the preserving order—very large and solid—the crop filled four huge baskets, each one a load sufficient for an average man to lift and carry. From the third tree, an espalier apple, of very moderate size, 700 choice russets were gathered, leaving some seven or eight dozen behind as being below a regular marketable standard. Thus for three young and comparatively small trees, no less than 2,152 count of good sound keeping fruit was gathered, and as there were some 25 distinct varieties of pear trees in the garden—all fairly well loaded according to their respective sizes and weight of fruit—for instance, one of them of no great size, whose fruit had easily been forced up to a pound in weight, yielded upwards of 400—the general crop from this source alone may in some degree be imagined—in fact, the hand-picking of the fruit, together with its storage and disbursement, formed about the heaviest as well as the most pleasurable job connected with the garden.

"The fruit grown consisted of Apples (good dessert sorts, Pears, choice varieties, such as Marie Louise, Duchesse, Beurré Diel, Muscatel, Jargonelle, &c., Peaches, the trees bearing immensely—the count of good well-ripened fruit going up to 300 on a single tree, Apricots, Plums of several varieties—the New Orleans kind cropping extra largely, and the Magnum Bonum going up to a quarter of a pound in weight, Melons, Grapes (out-door sweet water), Strawberries, Currants and Gooseberries, black and white Grapes, with other tender fruit, were grown under glass with similar success, and weight of fruit, but this kind being expensive to grow is not, nor probably ever will be, for the million in this country.

"Now none of this splendid fruit ever went to market—it was grown purely for the love of its growth, use and distribution —besides the *ad libitum* supply for his own table—(which was supplied as tables seldom are) "Head-gardener" sent weekly baskets for the greater part of each year to his own relations, who having more than they could consume, distributed in their turn, and his friends and neighbours were likewise liberally remembered. One lady not long ago told him that she felt sure that her aged mother's days had been lengthened by the constant supplies of delicious fruit sent her. But what surprised people more even than the unprecedented yield of fruit was the following circumstance, viz., that whenever blight (so-called) destroyed or partially destroyed (which it too often did) the fruit prospects of the neighbourhood and country at large, "Head-gardener's" trees were never once affected by it. Blight or no blight, fruit to almost any extent was always to be found in his garden.

"Not long ago, a near relative of mine, possessing a fine

large standard apple tree of a good dessert kind, non-bearing, begged me as a favour to take it in hand, and the following autumn the tree was so loaded with fruit that a cart (baskets being of little use), had to be backed up under it to convey away the crop—so that even half-a-dozen good trees well looked after, would constitute a respectable orchard, and become certain and valuable property."

In another case he restored an old, worn out, neglected orchard to such vigorous bearing that the trees had to be propped up to keep them from breaking down with the weight of fruit. Trees that had not borne fruit for fifteen years were restored to vigorous bearing in a single season.

A man who has done such work may well magnify his work. Mr. Kynaston says :—

"As fruit is one of nature's best medicines—being at one and the same time cooling, digestive, and health-giving—and is besides the direct alternative to the white bread, tough meat (as a rule) and other astringent food, which we daily and so largely partake of—its moderate constant use is therefore absolutely essential to our well and perfect being—consequently its proper cultivation would greatly add to our individual and national interests. Now I have found fruit easy enough to grow in marvellous quantity by the simple and inexpensive means which I have adopted : my plan being, after thinning out small poor fruit, to let the trees then bear to their very utmost, and the sure sign that they were equal to their work was, because they never dropped their fruit."

Mr. Kynaston says he has never exhibited or "paragraphed" his pears, nor sought for any publicity ; but having proved his work, he thinks it his duty to teach his method to the public.

What that method is we will show as clearly and briefly as we can.

A fruit tree, Mr. Kynaston says, has three kinds of roots, each with its own special function.

1. A tap root, going down perpendicularly from the trunk, simply to give a firm support to the tree. This should not be meddled with.

2. Long roots, corresponding to the branches of the tree, which supply the nutriment for woody growth. These should be pruned to limit and regulate such growth.

3. Flower and fruit feeding roots, which are small and thickly clustered round the trunk of the tree. These are to be cultivated and nourished that they may supply the fruit-making materials.

To restore a fruitless tree to its proper function, prune away surplus wood among the branches, but leave enough for fruit. This may be best done in autumn. In the spring, when the tree is about to blossom, dig a trench about it from four to six feet from the trunk—according to the size—and about a foot in

depth, and cut off the spreading roots. If the tree be small this can be done with a sharp spade. This will check the growth of wood and allow the life force of the tree to be chiefly expended upon its fruit.

The next point is to feed the starving fruit rootlets. As soon as the blossoms appear, do what the gardener in the parable of the barren fig-tree proposed to do—dig about and dung it. Carefully open and loosen the soil within a yard of the trunk, and moisten it daily with liquid manure, a bucketful to a small tree, and two or three to larger ones—half common manure and half water; and, Mr. Kynaston insists, all sewage and suds from the house, which, as the waste matter of human, fruit-eating creatures, is just the material needed by the tree to manufacture into fresh fruits. Guano also does well, and the sweepings of the hen-house. The great point is to provide the matter of which fruit is made *at the right time, in the right place, and in sufficient quantity.*

The right time is from the flower to the full grown fruit.

The right place is near the trunk of the tree where the fruit rootlets thickly cluster.

The right quantity is *enough.* The roots will not absorb more than they need. What remains will be good for next year. The trees will be none the worse for a winter crop of cabbages or other hardy plants.

Trees may be cleansed from parasites by washing with soda or lime. But a healthy, vigorous tree takes care of itself. It is the weak that suffer from parasites.

We give Mr. Kynaston's facts and his method. We have no doubt that the facts are true; and no doubt that the adoption of his method everywhere would add millions to the wealth, and greatly increase the health of the English people.

In one case where an old, neglected, unbearing orchard, had become a mere thicket of tangled branches, Mr. Kynaston—or "Head-gardener" as he likes to be called—took it in hand. It was a tough job, but "next year every tree responded grandly to the call of good cultivation—the trees cropping, in many instances so heavily, that props had to be placed under several of their branches, to prevent the weight of fruit from breaking them down—and the year after the crop was still heavier."

Fruit trees, Mr. Kynaston insists, cannot be injured by his process, and also cannot fail to bear abundant fruit. Trees which had not borne fruit for fifteen years, but only "made wood," have been perfectly covered with fruit in a single season.

Such being the fact, what is to hinder the whole country being covered with fruit, and every town supplied cheaply and abundantly with the best, most delicious, and healthiest food?

Speaking of the advantage which discoveries may be to Agriculture, Mr. Kynaston says:—

"People living in London can form but a poor idea of the

distress (ever-increasing) that exists in agricultural districts; both landlords and tenants are everywhere in large numbers, being either hopelessly ruined or else miserably reduced in circumstances. It really appears as if one section of the people were about to be starved, in order that the other might have cheaper food. We have, I fear, departed from the safe and happy medium course, and ventured on extremes, which always, as a rule, end badly."

Mr. W. S. Roberts writes:—"I am well acquainted with Bala, and its many drawbacks with respect to climate, frequent rains, bath springs, and cold piercing winds: but I can bear testimony to Mr. Kynaston's most wonderful success. Trees and shrubs which before scarcely bore any fruit are now with bended boughs and branches overloaded with fruit. Apple, plum, currant, and gooseberry trees all speak: If you but cultivate us aright, we will produce abundance and plenty for all. No doubt many thousands of pounds are lost annually through a lack of this knowledge of how to cultivate our fruit trees. Doctors of the highest standing have declared that the juice of ripe fruit is an antidote in cases of fever."—*Herald of Health.*

International Forestry Exhibition, Edinburgh.—Tuesday last was a great day in Edinburgh, and the whole populace—and the visitors too for the matter of that—seemed for the moment to have laid aside their normal pursuits, and to have suddenly become embued with the idea that the most burning question of the hour was "Forestry," and the only subject of conversation of interest to anybody that of trees, timber, and arboriculture. At the railway stations, hotels, and even in the streets, one had only to keep his ears open to know that the "Forestry Exhibition" was the uppermost thought in the minds of everybody, and this could not be regarded but as a happy augury for the success of the important undertaking in hand.

The grounds of Donaldson's Hospital, in which (by kind permission of the governors) the Forestry Exhibition buildings are placed, are situated in the West End of Edinburgh, about a quarter of an hour's walk from the western end of Princes Street, and are easily accessible by tram-cars and omnibuses.

The building, which has been constructed by Messrs. W. Beattie & Sons, builders and timber merchants, Edinburgh, from the designs of Mr. R. Morham, City Architect, at a cost of £5,000, consists of a great nave 600 feet in length by 50 in breadth, intersected in the centre and near each end by transepts 138 feet long and 50 broad. Over the intersection of the central transept with the great nave is a lofty dome, surmounted by a flagstaff, and at the corresponding intersections of the eastern and western transepts there are octagonal pavilions. The dome and pavilions diversify the outline of the huge building, add dignity, and secure effect in interior disposition, while further

variety is given by the transepts, whose southern front is relieved by ornamental pillars and steps leading down to the soft fresh turf of the lawn. Light is admitted to the building by means of lying lights along the upper half of the roof, side windows in the pavilions, and in the gables of the nave and transepts. Ventilation is secured by openings along the ridge. At right angles to the northern divisions of the transepts, and opening from them by means of handsome arcading, are three large annexes, the central one 200 feet in length by 31 in width, and the eastern and western 150 feet long and 31 wide. The building is appropriately composed of wood, and the roof is covered with Gray's patent felt. At the north side and between the transepts are two refreshment-rooms, each 100 feet in length by 20 in breadth, and alongside these are kitchens built of brick with corrugated iron roofing. Entrance to the main building is by means of a spacious corridor, which extends from the westernmost gate of the hospital ground to the west gable of the nave. This corridor is approached by a handsome granolithic pavement laid down gratuitously by Messrs. Stuart and Co., the patentees. A short flight of steps leads from the pavement to a picturesque Swiss porch, with triple arcading, projecting roof, and carved eaves. The porch opens into the corridor, which is 25 feet in breadth and 160 feet in length, when a turn is taken to the right, and the nave entered by means of a double flight of steps. On the left of the corridor is a series of rooms for the post and telegraph offices, left luggage, railway and police offices, &c.

In the interior the building is light, airy, and imposing. The perspective of the nave is attractive, the roof being supported by circular ribbed couplings, which have been painted a pretty light blue. Additional effect is secured by the fact that the northern divisions of the transepts are at a higher level than the nave, and are approached by a short flight of steps set off with ornamental railings.

Speaking generally, the exhibits are displayed on stalls 10 feet wide, fixed against the walls of the nave and transepts, with a central space fitted with tables or separate stalls, leaving a wide promenade on either side. What may be called the wall space in the nave and transepts has been reserved for Government or official collections from foreign countries, the central stalls and the annexes being devoted to private exhibitors. The whole building is illuminated at night by the electric light, fitted up by the Anglo-American Brush Electric Light Corporation. The wires are led along the roof on either side, and the arc lamps number 70, with larger ones for the dome and pavilions. The annexes, refreshment-rooms, and corridors are lighted by means of incandescent lamps some 150 in number.

We suppose there is some unknown power which designedly prevents exhibitions of every sort of kind from being in anything like an advanced state of preparation by the day announc-

ed for their opening, and the Forestry Exhibition is certainly no exception to the rule. On every side there are blank spaces and signs of unreadiness, the effect of which is intensified by the fact that the whole of the two transepts at the upper end of the building, reserved for the Japanese section, are at present entirely unoccupied. However, this will all doubtless soon be remedied, and in the meanwhile we propose to give our readers a few notes of the exhibits which are in their places, confining ourselves strictly to those more or less connected with the trades represented by this *Journal.*

Commencing on the right, as we enter the main building, the first exhibit to meet the eye is a small collection of the woods used in the Royal Arsenal at Woolwich, neatly put together in frames, exhibited by Her Majesty's Secretary of State for War. Almost immediately adjoining this—the places of honour being very properly given to our own Government departments—is the very creditable display made by the Commissioners of Her Majesty's Woods and Forests, which reflects great credit on all connected ; and Sir James Campbell, at Dean Forest, the Hon. G. Liscelles, at the New Forest, and Mr. F. Simmonds, at Windsor, have evidently spared neither time nor trouble in making their respective exhibits worthy of the important Government department to which they belong. A word of praise is also due to Sir Henry Loch, who, during his short tenure of office, did all in his power to facilitate the preparation of a good exhibit. The "Woods and Forests" exhibit consists generally of specimens of trees grown in the respective forests, with samples of tools used, photographs, plans, and a few arboreal curiosities. From Dean Forest we noticed a very fine oak plank, the tree from which it was cut being stated to have taken 200 years to arrive at maturity, a splendid specimen of oak, and a very useful table, showing the annual increase of circumference in some oaks during a long period of years. The New Forest sends some good specimens of timber, and a number of good photographs of the grand and old historic trees of that locality, besides a good collection of the tools now in use there. We noticed, amongst others, a curious excrescence of bark of an unusually massive nature, which had grown round the branch of an oak. The Windsor Park display is a remarkably good one, and comprises a very complete collection of foresters' tools, some of which are not generally used elsewhere. We notice a very useful tool for extracting roots from drains, in which position they are often very troublesome and destructive, and also a large root of elm taken out by the tool. The workmen's houses on the Windsor estate, as might be expected on a property in which the Prince Consort took so much interest, are models, and the plans of some of them which are exhibited will be much admired, and we hope imitated, by many landowners visiting the exhibition. Amongst many other interesting things, a plank

cut from Herne's Oak, and a grand root cutting from a larch 80 years old, are worth a special note. The remaining space in this transept is filled with specimens of wood from the Scotch estates of Munches and Methven, Perthshire, the Duke of Athol's woods (a very fine collection), the Duke of Devonshire's Irish estate of Lismore Castle, and the exhibits sent from Kew Gardens, mostly woods which were shown at the New South Wales Exhibition.

Continuing our tour along the right hand side of the centre nave devoted to the exhibits of British Colonies and Foreign Governments, which, with a few notable exceptions, are in a backward state, we come first to a very fine display sent from the Cape of Good Hope. There is a variety of handsome and useful hardwoods shown, mostly polished specimens, amongst which we may name stinkwood, hardpear, redwood, ironwood, white els, kaerswood, saffron, whitepear, assegai, &c. There is also a well-made model of a timber waggon, containing fourteen different kinds of wood, and a curious necklace and pair of earrings made from Cape melon seeds. The next section is that of Mauritius, from which Mr. J. Horne, Director of Forests and Gardens, has sent a remarkably fine collection of specimens of fibres and woods grown in that country. The Indian section is a thoroughly representative one, and occupies the whole of one transept, and thanks to the energy displayed by Colonel Michael, who is in charge of it, is in quite a finished state, and of a most interesting character. To all interested in Indian forestry we commend a careful perusal of the preface to the Indian section in the official catalogue, written by Sir George Birdwood, C.S.I. It does not fall within our province to notice the fine collection of trophies of the chase comprised in this section, and which, we suppose, are understood by the executive committee to form an important part of the subject of forestry, judging from the large amount of space they have devoted to them, but the collection of woods is worthy of a careful study. The local names are in some cases confusing, but two woods, called respectively "padowk" and "berar," struck us as being particularly worth the notice of cabinet-makers. Our next call was a particularly interesting one, and we stayed a long while in pleasant conversation with Mr. Meldrum, who is in charge of a very excellent collection, sent him by the Maharajah of Johore, who seems to be particularly alive to the value of his forests, and is turning them to account in a business-like manner, which one would hardly expect from an Eastern potentate. The independent State of Johore, as our readers may be aware, forms the most southern part of the great Indian Peninsula, and is separated from Singapore by the Straits of Malacca. This territory contains, it is said, an enormous amount of valuable timber, and there are hundreds of square miles of virgin forests. The variety of timber may be gathered

from the fact that the present exhibit contains specimens of no less than 357 different kinds. At the town of Johore Baru, the Maharajah has erected what is probably the largest saw-mill in Asia, and has fitted it throughout with first-class machinery, from the foundry of Messrs. McDowall & Co., of Johnstone, near Glasgow; there a large trade is done, both to meet the local demand, and also for export to Bombay, Calcutta, Australia, &c., and we were informed that three large ships, of 1,000 tons each, were lately loading timber at one time. There are numerous models and other things in this collection in addition to these specimens of wood, and we hope on a future occasion to return to this interesting subject.

From the south of India to the north of the American Continent is a long journey, but such trifles of distance are nothing at an International Exhibition, and accordingly a few steps brought us to the display of the New Brunswick Land and Timber Company. We are sorry we cannot congratulate the Government of New Brunswick on having sent a representative display, and it is much to be regretted if any false notion of economy has prevented them from voting the necessary funds to have their great forest treasures adequately shown at this important exhibition. From a chat with Mr. E. Jack, in charge of this exhibit, we gathered that the supply of first quality pine in New Brunswick is now very limited, and it is on the hardwoods, such as birch, beech, maple, and ash, that his company chiefly rely. We saw some very handsome specimens of these woods, in which there ought to be a larger trade done with this country.

Passing several interesting exhibits not directly within our province, and descending the left side of the main avenue, we pass Messrs. Churchill & Sim's specimens of foreign hardwoods, and come to a rather disappointing collection from Scandinavia. Sweden, with the exception of a good collection of boards arranged in columns, bearing Messrs. James Dickson & Co.'s well-known brand, and Messrs. F. Coster & Co.'s Uddevalla exhibit of trellis-work, mouldings, and barrels, is hardly represented at all. Norway relies on the good displays sent by Mr. Treschow-Fritzoe, of Laurvig and two firms of nurserymen.

British Guiana has a splendid collection in one of the transepts, containing specimens of greenheart, litterwood, and other handsome woods, many of which are but little known in this country. Denmark has a nice show of forest plans and tools, also photographs and maps. Reaching at length our point of departure, passing *en route* for the very fine and complete collection organized by the Scottish Arboricultural Society, we pause to take a good look at the Mammoth *sequoia* exhibited by the Californian Redwood Company. This giant of the forest, of which only the shell is shown, cut 5 feet from the ground, is 13 feet in diameter and 41 feet in circumference; height to first

branch 150 feet; total height 250 feet; estimated age 2,000 years. Stated to have produced 75,000 superficial feet board measure, and 6,250 cubic feet good timber.

Having now completed our tour of the main building, we may just mention that the centre is filled with a good collection of miscellaneous exhibits, including one of Mr. Gladstone's axes, and some chips from a tree felled by the right hon. gentleman, a good show of wood pulp, and the machinery in motion, which are both extensive and interesting. The Robey engines are there in great force, and are employed by the executive committee to drive the electric lighting machines, electric railway, &c. The wood-working machinery, with the exception of Messrs. McDowall and Sons, who send by far the most complete display, is in a backward state, but in a few days Messrs. Thos. Robinson and Son and Messrs. Sagar and Co. will doubtless be in working order. Messrs. McDowall and Sons have sent 17 machines in all.

Here for the present we close our notice of this most interesting exhibition, and in concluding we must say that there is an enormous mass of interesting information to be gained by a visit to it, and we doubt not that during the summer numbers of our readers will visit it and judge for themselves of the great efforts which the committee have made in securing the success of the first International Forestry Exhibition.

In future issues we shall give particulars of the various exhibits interesting to the timber trade, particularly the wood-cutting machinery exhibited by the various firms.—*Timber Trades Journal.*

SAWS.—The *Lumber World* says the Mechanics Association of Muehlhausen, in Germany, in their last annual report take a very decided ground against the use of circular saws, and advocate their abolition entirely wherever such action is possible. They base their conclusions upon the reasons that the use of circular saws involves more danger to the operators, that they require more power and waste more wood, and that their only advantage consists in a price smaller than that of band saws. The Germans use at the present day among their furniture-makers, carpenters and joiners, thirteen different varieties of saws, each one of which has its own peculiar size of the teeth, as well as a different relation of the teeth to each other. How important the thin saw blade is, not only as a means to save power, but also as a means to save wood, can be seen from the following. A log of walnut, 4 metres long and 1 metre diameter, cut into 20 pieces by the new horizontal saw frame saves 30 millimetres of wood when compared with the cutting of the old fashioned vertical saws. This is equal to a profit of 9 to 12 dollars. For Germany, where annually 100,000 cubic

metres of this wood is used in the various industries, this would represent a saving of 37,500 to 50,000 dollars. The greatest enemies of saws are the particles and pieces of iron found in woods; these are often driven in some form into young trees, and succeeding growth covers them up entirely. A curious collection of such ingrown iron particles was recently exhibited in Germany. It had been obtained from America, Prussia, Germany, Spain, and other countries, and exhibited the queerest forms of wood formation covering particles of iron of various shapes and sizes, whose presence was revealed only by a breaking of the teeth of the saw, and which without the cutting would have remained invisible to the human eye.—*Timber Trades Journal.*

THE YEW.—The yew is found here and there all over the country; it has been known to attain huge dimensions, although we are more familiar with it in connection with a shrubbery, as a shrub, than as a timber-growing tree. It is one of the most slow growing trees, and when cut down is also the hardest and compact. Where work of great strength is required the yew is found to be highly suitable, and it is said to be a wood that will endure without end. It has scarcely ever been discovered in a state of decay when found in use. It is celebrated for its toughness and elasticity and it is easily split. The colour of the wood is very beautiful, somewhat resembling orange-wood. The cabinet maker ranks it the highest amongst all the fancy woods for veneers for furniture, its rarity in a large state preventing the use of such fine timber in boards for the making of furniture. Although it is certainly too fine a wood to be employed for such purposes, there is no other wood to compare with it for machinery work—such as wheel cogs and screws, and axle-trees for carts—for strength and indestructibility, but its common use for these purposes is prohibited by its scarcity. Its most important use, as already stated, being for veneers, in which from the fine rich colour and the beauty of its veins exceed that of any other timber, and these veins extend through the roots.

The yew is very much used for the making of bows, for which purpose it is superior to any other wood.

The timber, when brought in, should be cut up into planks of rather a heavy thickness, from two inches and upwards, and allowed to season, which it takes a longer time to do than any other wood, but it loses almost nothing of its bulk; this is no doubt owing to the slowness of its growth and fineness in the grain.—*Timber Trades Journal.*

NOTE.—There is a large supply of yew wood in our Himalayan Hill Forests, and yet we have not yet heard of any demand for it.—[ED.]

IV. EXTRACTS FROM OFFICIAL GAZETTES.

1.—GAZETTE OF INDIA—

No. 514—*The 18th July, 1884.*—Consequent on the retirement from the service of *Colonel C. Batchelor*, Deputy Conservator of Forests of the 1st grade, in the Punjab, the following promotions are made in the Forest Department, with effect from the 10th June, 1884:—

Mr. M. H. Ferrars, B.A., Deputy Conservator of the 2nd grade, in British Burma (on deputation to the Andamans) and Officiating in the 1st grade of Deputy Conservators, is confirmed in the latter appointment.

Mr. E. P. Popert, Deputy Conservator of the 2nd grade, in British Burma, to officiate in the 1st grade of Deputy Conservators until further orders.

Mr. R. J. P. Pinder, Sub-Assistant Conservator in Oudh and Officiating in the 3rd grade of Assistant Conservators, is confirmed in the latter appointment.

Mr. J. E. Barrett, Sub-Assistant Conservator in the Punjab, is appointed to officiate as an Assistant Conservator of the 3rd grade, until further orders.

No. 519.—*Mr. R. J. P. Pinder*, Assistant Conservator of Forests of the 3rd grade in Oudh, is transferred to the Punjab.

2.—CALCUTTA GAZETTE—

The 25th June, 1884.—*Mr. W. M. Green*, Assistant Conservator of Forests, 1st grade, Officiating Deputy Conservator, 4th grade, is promoted to officiate in the 3rd grade of Deputy Conservators, with effect from 8th May, 1884, the date on which *Mr. W. G. Strettell*, Deputy Conservator of Forests, 1st grade, availed himself of the three months' furlough granted to him in the notification dated the 13th idem.

3.—NORTH-WEST PROVINCES AND OUDH GAZETTE—

No. $\frac{824}{\text{II-440-2}}$.—*The 15th July, 1884.*—*Mr. E. McA. Moir*, Deputy Conservator of Forests, Tons Division, to the charge of the Jaunsar Division of the School Circle, in addition to his present duties, during the absence on deputation to the Forest School at Dehra Dún of *Mr. N. Hearle*, Assistant Conservator of Forests, or until further orders.

4.—PUNJAB GAZETTE—

No. 321.—*The 8th July, 1884.*—*Colonel C. Batchelor*, Deputy

Conservator of Forests, 1st grade, vacated his appointment in the Punjab Forest Department, with effect from the 10th June, 1884, consequent on his attaining Colonel's allowances.

No. 322.—*Mr. A. E. Wild*, Deputy Conservator of Forests, 2nd grade, on being relieved, on the 5th May, 1884, of his appointment as Officiating Conservator of Forests, was attached to the Hazára Division, and received charge of that Division on the 10th June, 1884, from *Colonel Batchelor*, Deputy Conservator, 1st grade.

No. 324.—His Honor the Lieutenant-Governor has been pleased to make the following promotions with effect from the 10th June, 1884, consequent on the retirement from the Department of *Colonel C. Batchelor*, Deputy Conservator, 1st grade :—

Mr. A. E. Wild, Deputy Conservator, 3rd grade, to be Deputy Conservator, 2nd grade.

Mr. W. Shakespear, Deputy Conservator, 4th grade, and Officiating Deputy Conservator, 3rd grade, to be confirmed in the latter appointment.

Mr. E. Forrest, Deputy Conservator, 4th grade, to officiate as Deputy Conservator, 3rd grade.

Mr. E. A. Down, Assistant Conservator, 1st grade, and Officiating Deputy Conservator, 4th grade, to be confirmed in the latter appointment.

Mr. A. M. Reuther, Assistant Conservator, 1st grade, to officiate as Deputy Conservator, 4th grade.

Mr. E. S. Carr, Assistant Conservator, 2nd grade, and Officiating Assistant Conservator, 1st grade, to be confirmed in the latter appointment.

5.—Central Provinces Gazette—

No. 3160.—*The 2nd July, 1884.*—That portion of Notification No. 2272, dated 10th May, 1884, confirming *Mr. G. F. Taylor*, in the 1st grade of Assistant Conservators of Forests, is hereby cancelled. *Mr. Taylor* will continue to officiate as Assistant Conservator of the 1st grade, until further orders.

6.—British Burmah Gazette—

No. 24.—*The 2nd July, 1884.*—The Chief Commissioner is pleased to appoint *Mr. Charles Ingram* to be a Probationary Sub-Assistant Conservator of Forests in British Burma, with effect from the 1st July, 1884.

No. 26.—*The 8th July, 1884.*—*Mr. H. Slade*, Assistant Conservator of Forests, 3rd grade, is promoted to be an Assistant Conservator of Forests, 2nd grade, with effect from the 9th June, 1884.

No. 27.—The following promotions are made in the British Burma Forest Department, with effect from the 14th May, 1884 :—

Mr. J. Nisbet, Deputy Conservator of Forests, 4th grade, to be Deputy Conservator, 3rd grade.

Mr. F. W. Thellusson, Assistant Conservator of Forests, 1st grade, to be Deputy Conservator, 4th grade.

Mr. J. N. Pickard, Assistant Conservator of Forests, 1st grade, to be Deputy Conservator, 4th grade.

Mr. T. A. Hauxwell, Assistant Conservator of Forests, 2nd grade, to be Assistant Conservator, 1st grade.

Mr. A. Weston, Assistant Conservator of Forests, 2nd grade, to be Assistant Conservator, 1st grade.

No. 28.—*The 5th July, 1884.*—The services of *Mr. J. W. Oliver*, Deputy Conservator of Forests, are placed temporarily at the disposal of the Government of India in the Home Department, with effect from the date of his return from the privilege leave granted to him in this Department Notification No. 18, dated the 5th June, 1884.

No. 5.—*The 15th July, 1884.*—*Mr. E. P. Popert*, Deputy Conservator, made over, and *Mr. H. Slade*, Assistant Conservator, received, charge of the Toungoo Division on the forenoon of the 24th ultimo.

Mr. Popert availed himself on the forenoon of the same date of the privilege leave granted him in Revenue Department notification No. 16F., dated the 5th June, 1884.

7.—ASSAM GAZETTE—

No. 239.—*The 3rd July, 1884.*—*Mr. H. G. Young*, Assistant Conservator of Forests, 3rd grade, made over charge of the Cachar Forests Division to *Babu Jagat Bandhu Nag*, Extra Assistant Commissioner, on the forenoon of the 23rd June, 1884, and availed himself of the privilege leave granted to him in Notification No. 191, dated the 29th May, 1884, published in the *Assam Gazette* of the 31st idem.

8.—MYSORE GAZETTE—

No. 71.—*The 11th July, 1884.*—*Mr. J. Stephens*, Sub-Assistant Conservator of Forests, Hassan, is granted six weeks' privilege leave of absence in extension of that granted to him in this Office Notification No. 23, dated 9th May, 1884.

9.—MADRAS GAZETTE—

The 27th June, 1884.—With the approval of Government, *T. Somasundra Mudaliar*, Sub-Assistant Conservator, is considered to have acted as Sub-Assistant Conservator, 1st grade, from 17th September to 17th December, 1883, during which period he held charge of the District Forest Office, Nellore.

The 4th July, 1884.—*M. Shams-ud-dín Sáhib*, Forest Ranger, 5th grade (on probation), South Coimbatore Division, is granted one month's leave on medical certificate, under Section 128, Civil Leave Code, 6th Edition, in extension to that already granted in the *Gazette* of the 10th ultimo, Part II., page 812.

The acting appointment of Forester, 2nd grade, *C. Appachi Pillai*, as Forest Ranger, 4th grade, Madura Division, during the absence of Ranger *Sakárám Ráo*, published at page 898, Part II. of the *Fort St. George Gazette* of the 24th June last, will cease from the date of his relief by Ranger, 2nd grade, Subba Aiyar.

No. 125.—*The 11th July, 1884.—Major I. Campbell-Walker*, Senior Conservator of Forests, in charge of the Southern Circle, three months' privilege leave from or after the 1st August next, under Section 74 of the Civil Leave Code, 6th Edition.

No. 127.—*Mr. J. S. Gamble*, Junior Conservator of Forests, in charge of the Northern Circle, to act as Senior Conservator, and to have charge of both circles during the absence of *Major I. Campbell-Walker* on leave, or until further orders.

10.—Bombay Gazette—

No. 5954A.—*The 24th July, 1884.*—In exercise of the power conferred by Section 29 (*a*) of the Indian Forest Act, No. VII. of 1878, His Excellency the Governor in Council is pleased to declare the following kinds of trees in the Protected Forests, specified in Government Notification No. 5954 of this day's date, to be reserved from the 15th of August, 1884:

Trees above referred to.

1 Teak.	9 Dháwra.
2 Blackwood.	10 Nim.
3 Ain.	11 A'wal.
4 Chinch.	12 Mango.
5 Bábul.	13 Charoli.
6 Khair.	14 Mhowra.
7 Tiwas.	15 Jámbul.
8 Hirda.	16 Anjan.

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